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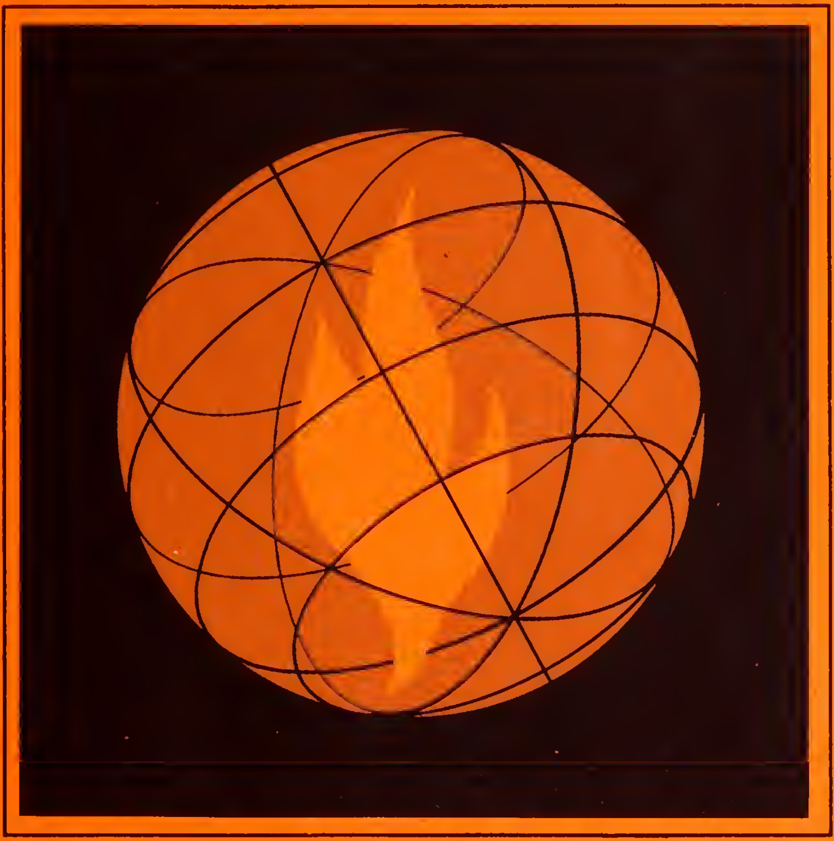
FIRE TECHNOLOGY ABSTRACTS



U.S. DEPARTMENT OF COMMERCE
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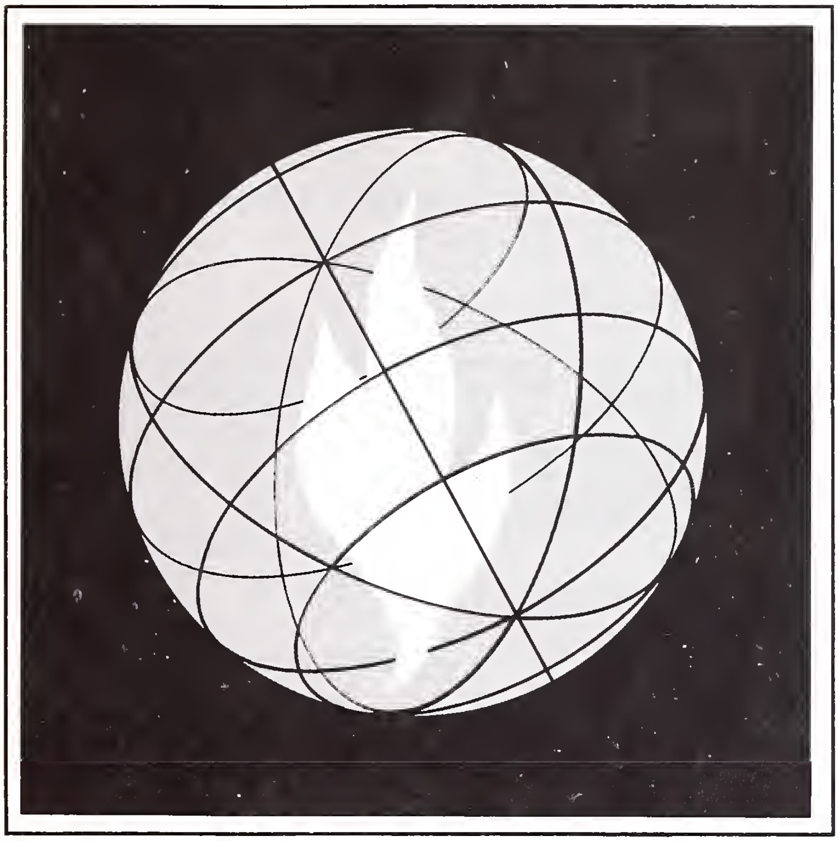
FIRE TECHNOLOGY ABSTRACTS



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FIRE TECHNOLOGY ABSTRACTS

Fire Technology Abstracts is an abstracts journal being prepared bimonthly by the Fire Problems Program Group of the Applied Physics Laboratory of the Johns Hopkins University, Laurel, Maryland, USA, under the sponsorship of the U.S. Fire Administration (formerly the National Fire Prevention and Control Administration) of the US Department of Commerce.

SCOPE AND COVERAGE

The aim of *Fire Technology Abstracts* is to provide comprehensive reference to the applied fire literature in the broad range of topics outlined in the "Table of Contents." Most topics are covered fully; a few topics, such as forest fires and mine fires, are referenced selectively, because they are covered systematically in other specialized indexing and abstracting serials. For such topics an appropriate notice has been entered under the respective category.

The information contained in *Fire Technology Abstracts* has been gleaned from a wide variety of sources (journals, books, reports, patents, codes, and standards), with particular emphasis on the report and patent literature, for which referencing heretofore has been inadequate. Although the English-language literature comprises the majority of the entries, the coverage includes selections from the world fire literature, identified in part through such sources as *Safety in Mines Abstracts* of the Safety in Mines Research Establishment (UK), identified in the abstracts as (SMRE), the Soviet *Abstracts Journal*, Series 68, "Fire Protection," identified as (RZh), and the card abstracts issued monthly by the Fire Literature Documentation Section of the German Fire Technology Research Center at the University of Karlsruhe, identified as (Fachdok).

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ARRANGEMENT

The journal is arranged in two sections: Abstracts and Indexes.

The *Abstracts* section contains complete bibliographic description required for identification of the item, along with a brief description of the contents of the item, usually consisting of the author's abstract, summary, or conclusions. The patents entries contain, in addition, citations of the patent classes, in most cases in accordance with the international classification system, in some cases preceded by classes according to a national classification scheme, as well as filing and disclosure dates, priorities and, if available, assignees. The abstracts are classified under the 13 main categories listed in the "Table of Contents" and a suitable number of subcategories, which are subject to revision as the necessity for finer classification arises. The page-keyed categories and subcategories of the "Table of Contents" are repeated on the appropriate pages in the abstracts section to assist the reader in rapid identification of the topical field of interest. Whenever available, the affiliation of the principal author has been entered in parentheses.

The *Index* section consists of four indexes: author, subject, source, and report number. Each entry in each index is keyed to an abstract number. Annual cumulative indexes will be published.

The *Author Index* is an alphabetical list of all authors cited in the abstracts section, whether principal or secondary.

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The *Source Index* displays citations in alphabetical order of the sources under the headings: Books, Codes, Conferences, Congresses, Dissertations, Journals, Meetings, Patents, Reports, Seminars, Standards, and Symposia.

The *Report Index* lists in alphanumeric order the numbers of all the reports entered in each issue, including multiple numbers, as well as the accession numbers under which reports are available from document repositories.

These indexes (as indeed the entire journal) are prepared on an IBM 360/91 computer, using the INFO-360 Document Writing Package of programs developed at the Applied Physics Laboratory. The final edited file is reformatted to drive a photocomposing machine. All but the subject index are produced directly from the printed portion of the entries. The subject index terms are typed in at the ends of the abstracts, but are not printed in the body of the journal. Author affiliations, whenever available, are also included in the records. Except for the primary author's affiliation, however, these are not printed, but are reserved for future use. Upon completion of an issue, the file is reformatted and coded to drive a Linotron photocomposing machine.

AVAILABILITY

Fire Technology Abstracts is a literature announcement service only and cannot respond to requests for the documents announced in the journal. For all literature citations an effort is made to provide the information needed by the reader to acquire the document. In general, however, the full text of many of the journal articles cited in the *FTA* can be purchased through the Original Article Tear Sheet service (registered trademark OATS) of the Institute for Scientific Information (registered ISI) in Philadelphia, PA. The full text of those abstracts terminating with (Fachdok plus number) can be purchased by citing the number and ordering from the Documentation Center of the German Fire Technology Research Center in Karlsruhe, FRG. The addresses of these two organizations are given below.

For *books*, *monographs*, *conference papers*, and *proceedings* the source is, in most cases, either the publisher or the sponsoring organization.

Dissertations are available in xerographic copy from University Microfilms of Ann Arbor, Michigan.

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FIRE TECHNOLOGY ABSTRACTS

Volume 2, Number 1/2 July-October 1977

FIRE TECHNOLOGY ABSTRACTS

1. GENERAL

a. FIRE PROTECTION ORGANIZATION

1. Anon
COLLECTIVE SELF-DEFENSE
ASELF; (57):55, 61, 63, 65, 67, 69, 71, 73, 79, 1976 (Spanish)

Collective self-defense, along with fire protection, maintenance of public order, medical service, and other services, is a component part of civil defense of the country and is a system of organizational and operational measures aimed at taking the first steps in self-defense during emergencies. The principal aspects of collective self-defense were laid down in the national fire protection regulations first promulgated in 1975. The primary unit of the collective self-defense system is the family, whose members organize fire extinguishing and evacuation to safety within the confines of its residence. The next level of collective self-defense is a group of residents of a building, a part of it or several buildings of from 100-200 people. It is headed by a group leader and two deputies (one responsible for the rescue equipment, the other for maintaining public order). The rescue team includes 3 sections: firefighting, rescue and medical. The collective self-defense of a block can combine 800-1600 residents and coordinates rescue and other activities of individual groups of residents in the block until the arrival of specialized civil defense units. The self-defense system of a microdistrict includes 5-10 blocks (5,000 to 10,000 residents). Shelters in the basements of various buildings are organized within the limits of the microdistrict. In addition to organization of the collective self-defense system on a territorial basis, it is proposed to form collective self-defense in institutions, plants, educational occupancies, and commercial buildings. The structure of collective self-defense in such occupancies is given: the chief, the technical section, and heads of the units which, as a rule, must safeguard public order, if necessary, communications, transmission of alarms, black-outing, fire extinguishing, the rescue of people, first aid, and evacuation to the shelters. The members of each unit must be equipped in a suitable fashion and must be able to handle the tools and equipment with which they are entrusted. 6 figs. (RZh)

2. Buerger A
THE HISTORY OF THE GERMAN FIRE SERVICE ASSOCIATION
Brandschutz; 31(4):97-99, 1977 (German)

On the occasion of the 25th anniversary of the rebirth of the German Fire Service Association, the historical development of the Association is recounted from the beginning. In some German cities volunteer firefighting corps had already existed in the forties of the last century. These corps were invited to a meeting (the foundation meeting) in 1853 by C. D. Magirus, commandant of the Ulm fire department; the first German Fire Service conference was held in 1854. The subsequent development is marked by efforts to join up all the German-speaking fire departments. A basic change in the structure of the association occurred during the Nazi period. A return to the old structure was made possible by the new democratic order in Germany. (Fachdok 13/0739)

3. Tverskoi I [*Novosti Press Agency, Moscow, USSR*]
FIRE-FIGHTING IN THE USSR
Fire; 69(862):558, 560, 1977

Fire-fighting organization, research, education and training, volunteer services, fire prevention, new fire-fighting equipment and vehicles, and protective equipment for firefighters are presented in this photo-essay contributed by the Novosti Press Agency. 6 photos.

4. Anon
THE FIRE PROTECTION OF A COMMUNITY THAT IS "BURSTING AT THE SEAMS"
Fire Prot Rev; 40(442):20-22, 27-28, 1977

A somewhat detailed picture of the development background of the Hong Kong region, covering constituent areas, demographic information, economic resources, and the like, forms a framework against which the singular conditions faced by the fire-fighting services are described. Particular attention is devoted to the types of structures found, the hazardous living and working conditions, the density of housing, and all the conditions peculiar to the congested region which hinder firefighting. The organization, equipment, operations, and high efficiency of the Hong Kong Fire Department are discussed. 4 photos.

5. Dulong P
THE FACILITIES, EQUIPMENT, AND ACTIVITIES OF CERCHAR
Glueckauf; 113(4):174-181, 1977 (German)

The present Centre d'Etudes et Recherches des Charbonnages (CERCHAR) in France (Coal Research Center) was founded in 1947. A woods in Verneuil-en-Halatte on the banks of the Oise river covering an area of about 50 hectares (123.5 acres) 50 km from Paris was chosen as the site for the main institutes, which cover an area of 25,000 m². About 650 people, among them 150 engineers, are employed at CERCHAR. The institute deals with, among other things, mine fires, especially the characterization of the fire hazards of seams, early detection and prevention of fires, test methods to evaluate explosives, and the prevention of firedamp and dust explosions. 5 figs. (Fachdok 13/0647)

6. Anon

FOUNDATION OF A CENTER FOR FIRE PREVENTION AT SEA

Sekiyu Shiryo Geppo; 21(10):747-749, 1976 (Japanese)

An analysis is made of the activities of the Japanese maritime fire protection services for the period 1922-1974. Examined are the organizational and administrative structure of these services, whose functions include the prevention and suppression of fires in ports and various shore installations, as well as on board ships. Some organizational and technical aspects of the foundation of a unified maritime fire protection service with a centralized administration combining all the existing regional services and having a hierarchical structure are discussed. An analysis is made of the number and types of fire-extinguishing, transportation, and other means required by such a unified system. At the present time Japan has 180 specialized fireboats of the "Nunobiki" and "Himaru" types assigned to the regional services. As a rule, these services function in maritime port zones and have a personnel of 15-50 men each, as well as 1-10 fire apparatus, not counting auxiliary vehicles. It is pointed out that an essentially new function of the unified, centralized maritime fire protection service that distinguishes the new service from the existing system of regional services is the round-the-clock fireboat patrol which monitors predetermined routes according to an established pattern. For this purpose a network system of radio communications and control is being developed that will equip fireboats with unified receiving and transmitting sets and which will use the 27 MHz frequency range. (RZh)

b. MEETINGS AND PROFESSIONAL ACTIVITIES

7. Marchant EW [*Edinburgh Univ, UK, Dept Fire Saf Eng*]

HUMAN BEHAVIOUR IN FIRE

Fire; 70(865):76, 1977

The work being done by twenty researchers involved in various aspects of human behavior and fire safety is outlined in this account of a recent international meeting held at Surrey University, UK. Four principal areas of research were identified. Work is being done to compare the existing safety level and the level considered optimum by the occupants or users of a building. Computer programs are being developed in the US and Austria for escape route design. One of the programs has the objective of considering the complex interactions of fire development and the people content of a building against a time base. Much discussion during the seminar focussed on health and care buildings, analysis of which has identified a number of areas where further research or investigation is necessary.

8. Anon

A REVIEW OF PAPERS PRESENTED AT THE CAA FIRE SERVICE SEMINAR

Fire Prot Rev; 40(440):16-18, 1977

Ten of the papers presented at the recent Civil Aviation Authority (UK) Fire Service Seminar at the Stansted Fire Service Training School are reviewed. The titles of the ten papers are as follows: The Realities of Training for Airport Operations; Aerodrome Fire and Rescue Services – The Financing and Involvement of Local Authority Aerodromes; Developments in the Design of Aerodrome Fire Appliances; A Blind Navigation System for Airfield Vehicles; Communications Between Flight Decks and Aerodrome Fire Service; Foaming of Royal Air Force Runways; Landing Gear Fires – Some Incidents and Causal Factors; Full-Scale Fire Modelling Tests of a Compact Rapid Response Foam and Dry Chemical Powder Dispensing System; Fifteen Years of AFFF Technology – Recent Industrial Applications for an Established Airfield Fire Extinguishing Agent; and Aircraft Rescue and Fire-Fighting on the Mainland of Europe. (For a review of another paper on structural fire protection consult the Source Index under Journals, *Fire Prot Rev*, 40(441):16-17, 19, 1977, in this issue of *FTA*.)

9. Kaps D

EIGHTEENTH MEETING OF THE IMCO "FIRE PROTECTION" SUBCOMMITTEE

Hansa; 113(23):2072-2073, 1976 (German)

A brief report is made on the 18th Meeting of the IMCO "Fire Protection" Subcommittee, which was held in London on 15-19 March, 1976. Each of the principal points on the agenda is discussed, as follows: 1) General; 2) Fire Test Procedures; 3) Tanker Ship Fire Protection; 4) Fire Protection during Transportation of Hazardous Goods; 5) Fire Protection of Passenger Ships Carrying Not More than 36 Passengers; 6) Drilling Platforms; 7) Special-Purpose Ships; 8) Fire Extinguishants (Halons and Low-Expansion Foams); and 9) Miscellaneous (Container Ships and Lighters; Tankers; Novel Types of Craft). The next meeting of the subcommittee is scheduled for the end of 1976.

10. Billinger J

EIGHTEENTH MEETING OF THE IMCO "FIRE PROTECTION" SUBCOMMITTEE

Seewirtsch; 8(10):581, 1976 (German)

A brief report is given of the Eighteenth Meeting of the IMCO "Fire Protection" Subcommittee, which was held in London on 15-19 March, 1976. Delegates from 21 countries and 5 international organizations attended the meeting. Four working groups were concerned with the professional subjects up for discussion at the meeting, as follows: 1) Fire Test Methods; 2) Fire Protection During the Transportation of Hazardous Goods; 3) Fire Protection for Passenger Ships with Fewer than 36 Passengers on Board; 4) Special-Purpose Ships; 5) Future Concepts for Fire Protection; 6) Changes to Chapter II-2 of the ISSV 1974; 7) Fire Protection for Containers and Container Ships; 8) Fire Protection for Carrier and Carrier Lighters; 9) Fire Protection on Tankers; and 10) Miscellaneous. The 19th meeting of the subcommittee is scheduled for 23-29 November 1976.

11. Anon
FIRE RETARDANCY IN THE CONSTRUCTION INDUSTRY
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers (published 1977); 1976, Oct 18-21, Orlando, FL
Sponsor: Fire Retardant Chemicals Assoc

The 14 papers of the Fall Meeting of the Fire Retardant Chemicals Association devoted to fire retardancy in the construction industry, which was held at the Contemporary Hotel, Walt Disney World, Orlando, Florida, on October 18-21, 1976, are presented in this volume. For abstracts of the individual papers consult the Source Index of this issue of *FTA* under "Meetings." 173 pages.

12. Anon
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc (published 1977); 1976, Dec 6-9, New York, NY
Sponsor: Information Council on Fabric Flammability

Published in this *Proceedings* are the committee reports, the business meeting, flame retardant textile bibliography, and the papers presented at the 10th Annual Meeting of the Information Council on Fabric Flammability, which was held at the Biltmore Hotel in New York City on December 8-9, 1976. Materials from this proceedings are abstracted separately in this issue of *FTA* and can be found by referring to the appropriate entries in the Source Index under "Meetings." 356 pages.

13. Burtner C, Yuill C, Smaviga T, Castino T, Ryan J, Roux H and Morelli M
MEETING ON CARPET FIRE TESTS, NOVEMBER 5, 1975. Fed Facilities Des Standard Task Grp, Nat Fire Prev and Control Admin, Dept Commerce, Washington, DC; FFD STG-1, 11 pages, May 1977
Availability: NTIS

The meeting was held to review existing and proposed carpet fire tests with respect to the rationale behind their need, development, and use. Five specific tests were reviewed in detail. This report consists of summary minutes and a recommendation. After reviewing the meeting minutes and other factors, the Task Group's recommendation is that Federal agencies, when procuring or specifying carpet or carpet systems for installation in corridors and exitways, require compliance with Federal Standard No. 372, "Test for Critical Radiant Flux of Carpet Flooring Systems" (when promulgated) for flammability requirements. Continued reference to other tests will be necessary during a transition period. (Author)

c. LITERATURE AND NOTICES

14. Bahme CW
FIRE OFFICER'S GUIDE TO EXTINGUISHING SYSTEMS
NFPA, Boston, MA; 104 pages, 1977

The purpose of this *Guide* is to acquaint firefighters, particularly fire officers, with the fundamentals they should know about various systems in use today, not only to help them give guidance to persons seeking better ways to protect their premises and processes, but also to enable them to better evaluate a situation in a fire emergency in terms of what they can expect an extinguishing system to accomplish. This *Guide* also sets forth procedures the fire officer should follow to assure that a system is restored to service after a fire. The twelve chapters comprising the book are as follows: 1) The Need for Extinguishing Systems; 2) NFPA Standards on Fire Extinguishing Systems; 3) Fixed Extinguishing Systems in General; 4) Water Sprinkler Systems; 5) Water Spray Fixed Systems; 6) Foam-Water Systems; 7) Foam Extinguishing Systems; 8) High-Expansion Foam Systems; 9) Dry Chemical Systems; 10) Carbon Dioxide Systems; 11) Halogenated Agent Systems; and 12) Explosion Suppression Systems. (Author)

15. Anon
FIRE OFFICER'S GUIDE TO OPERATING AERIAL LADDERS
NFPA, Boston, MA; fourth edit, 239 pages, 1977

The three previous editions of this book were written to serve as operations manuals, primarily for the interests of company officers and firefighters involved in the direct operations of aerial ladders. For this current edition, editorial changes have been made to make it more suitable for classroom work and semester schedules. Questions are included at the end of each chapter to permit text review and to stimulate thought, reasoning and discussion. Manufacturers manuals on specific types of apparatus contain a great deal of helpful information on mechanical functions, safe working loads and operational limitations of apparatus under varying service conditions. A list of other references is included on page 230 to give the reader additional sources of information.

16. Anon
FIRE PROTECTION OF BUILDINGS AND STRUCTURES
[Protivopozharnaya Zashchita Zdaniy i Sooruzheniy]
VIPTSh MVD SSSR, Moscow, USSR; 169 pages, 1976 (Russian)

This digest contains papers on the fire protection of buildings and structures from the Advanced Fire Engineering Academy of the Ministry of Internal Affairs of the USSR. The papers were contributed by both staff and student-body members. The titles and pages of 21 of the papers are as follows: Statistical Study of Some Aspects of the Course of Fire Service Operations (3-11); The Problem of Allocating Fire Units (12-16); The Problem of Organizing the Record-Keeping System of Fire Protection Activity in the People's Republic of Bulgaria (17-20); Device for Investigating the Ignition of Structural Materials by an Electric Spark (37-43); Some Aspects of the Commercial Attractiveness of Firefighting Equipment in the World Market (44-48); Method and Some Results of a Statistical Study of the Effectiveness of Automatic Fire Protection Equipment in Plants of the National Economy (49-55); Nomogram for Evaluating the Combustibility of a Vapor-Air Mixture in RVS-5000 Tanks During the Process of Extracting Oil Products (56-64); Study of Ship Living Quarter Fires Using Models (67-71); Study of Radiation and Absorption of Smoke Gases Containing Solid Particles (72-76); Method of Experimental

Study of Drops of a Water-Gas Suspension During Fires (77-80); The Problem of Developing Highly Effective Fire Hydrant Locators (81-84); Study of Coatings over Shaped Steel Flooring Under Fire Conditions (92-100); Water-Vapor Fire-Extinguishing Efficiency (101-104); Criteria for the Effectiveness of Automatic Fire Detection and Alarm Systems (105-111); Planning Technical Maintenance of Fire Apparatus (112-120); Status of Hose Management in Some Fire Brigades (121-124); Study of the Discharge Parameters of Streams of Chemical Powder Extinguishants (125-129); Study of the Process of Fire Spread Over Solid Combustibles (130-136); Tactical Potentials of Teams Using Basic Fire Apparatus (137-140); Principles of Construction of a Multi-Channel Data Transmission System in a Complex of Technical Protection Systems (141-146); and The Use of an Asynchronous Information Transmission Method in a Complex of Technical Protection Systems (147-156). (RZh)

17. Anon
PHOTOGRAPHY FOR THE FIRE SERVICE
Fire Protection Publications, Oklahoma State Univ, Stillwater, OK; 1st edit, 200+ pages, 1976

This complete user's approach to fire photography is an easily understandable text written for and by fire service photographers. It covers subjects in step-by-step detail from choosing the right film and camera to fire and arson investigative photography. Photographic darkroom set-up is explained and illustrated. It is designed for both the beginner and the practicing photographer, is illustrated with more then 200 photographs and figures, and has a complete glossary of photographic terms. The 13 chapters are as follows: How a Camera Operates; Types of Cameras; Films Available; Light; Taking the Picture; Negative Processing; Printing the Negative; Accountability and Storage of Photographic Materials; Fire Scene Photography; Training Aids; Public Relations; Photography for Investigation and Photography for Fire Prevention. This volume is numbered IFSTA 204 in the International Fire Service Training Association's series of publications.

18. Anon
FLAME RETARDANT TEXTILE BIBLIOGRAPHY 1975-1976
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 28-166
Sponsor: Information Council on Fabric Flammability

The flame retardant textile bibliography covers the literature produced during the period 1975-1976. The 463 entries are arranged under the following sections: I. Books; II. General; III. Fundamentals: Pyrolysis, Combustion and Mechanisms; IV. Flame-Resistant Cellulose; V. Flame-Resistant Wool; VI. Flame-Resistant Synthetic Polymers and Blends; VII. Analysis and Testing; VIII. Laundering and Maintenance of Flame-Retardant Fabrics; and IX. Patents. A subject index covering this bibliography and those published in past proceedings (1967-1976) is included.

19. Jason NH
FIRE RESEARCH PUBLICATIONS, 1976. Nat Bureau Standards, Inst Appl Technol, Center for Fire Res; NBSIR 77-1277, 13 pages, Jul 1977
Availability: NTIS

"Fire Research Publications, 1976" is a supplement to the previous editions, which covered the years 1969-1972 (NBSIR 73-246, NTIS Order No. COM-74-10989; $3.25), 1973 (NBSIR 74-511, NTIS Order No. COM-74-11448; $3.25), 1974 (NBSIR 75-736, NTIS Order No. COM-75-11018; $3.25), and 1975 (NBSIR 76-1120, NTIS Order No. PB-257837; $3.50). Only publications prepared by the members of the Center for Fire Research (CFR), by other National Bureau of Standards (NBS) personnel or external laboratories under contract or grant from the CFR are cited. Articles published in NBS house organs also are cited. (Author)

20. Pelouch JJ, Jr, Mandel G and Ordin PM
VOCABULARY OF AEROSPACE SAFETY TERMS PERTAINING TO CRYOGENIC SAFETY, FIRES, EXPLOSIONS, AND STRUCTURE FAILURE. Nat Aeron and Space Admin, Lewis Res Center, Cleveland, OH; NASA TM-X-73521, 122 pages, Sep 1976
Availability: NTIS N77-11901

This vocabulary listing characterizes the contents of over 10,000 documents of the NASA Aerospace Safety Research and Data Institute's (ASRDI) safety engineering collection. The ASRDI collection is now one of the series accessible on the NASA RECON data base. There are approximately 6,300 postable terms that describe literature in the areas of cryogenic fluid safety, specifically hydrogen, oxygen, liquefied natural gas; fire and explosion technology; and the mechanics of structural failure. To facilitate the proper selection of information, nonpostable, related and array terms have been included in this listing. (Author)

21. Young ME
PROTECTIVE CLOTHING. PART 2. FIRE AND RADIATION ENVIRONMENTS (A BIBLIOGRAPHY WITH ABSTRACTS). Nat Tech Inf Service, Springfield, VA; NTIS PS-76/0268, 89 pages, May 1977
Availability: NTIS

Research on clothing and equipment for maximum protection while fighting fires and in radiation conditions is described in the report's abstracts. Treatment of fibers and textiles, design of clothing, testing for physiological tolerances, methods of decontamination after exposure, and equipment acceptability are topics included. (This updated bibliography contains 84 abstracts, 16 of which are new entries to the previous edition.) (Author)

d. FIRE AND EXPLOSION INCIDENT CRITIQUES AND ANALYSES

22. Anon
INSTRUCTIVE FIRES: UNPROGRAMMED FIRE
Face au Risque; (126):19, 21, 1976 (French)

The offices of the "Ateliers de Mecanographie," a photocopying shop, were on the ground floor; the computer rooms, the files, the lounge, and the cafeteria were in the basement. The deficiencies were unsuitable facilities and a lack of detectors and sprinklers. The end result of this fire is that files with magnetic tapes must be much better protected and access areas must be free of obstructions. Basements are not suitable for the storage of files and for computer rooms; they belong on the ground floor (protected against water). Walls, inner walls, and ceilings must be adequately fire resistant and the doors must have a 2-hour fire rating. 2 figs. (Fachdok 13/0522)

23. Hewes BV [*Nat Fire Prot Assoc, Boston, MA*]
LESSONS FROM AIRCRAFT FIRE ACCIDENTS: CASE NO. 1
Fire Internat; 5(54):59-63, 1977 (English, German, French; Spanish Summary)

On July 11, 1973, a Boeing 707 enroute from Rio de Janiero to Paris made an emergency landing at Orly; of the 134 persons on board, 123 were killed. Subsequent investigations and reports from survivors indicated that a smoldering fire had probably broken out in the wastebasket for used towels and other items in one of the lavatories and that it had not been discovered in time. Ten safety recommendations were made by the investigating committee, among them a strict prohibition of smoking, distinct smoking prohibition signs in toilets, installation of metal trash containers, installation of an adequate number of effective fire extinguishers, provision of a sufficient number of cabin crew oxygen masks, toilet supervision during critical times, smoke evacuation procedures, exclusion of flammable items from toilets, crew member instruction in fire hazards, and regular checks of fire-fighting materials and facilities. (This is an abridged version of a paper presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.)

24. Tryon GH [*Nat Fire Prot Assoc, Boston, MA*]
LESSONS FROM AIRCRAFT FIRE ACCIDENTS: CASE NO. 2
Fire Internat; 5(54):65-70, 1976 (English, French, German; Spanish Summary)

One hour and 25 minutes after a maintenance man had accomplished a security check on board a Lockheed L-1011 at the Logan International Airport in Boston, flames were detected coming over the top of the fuselage. Five major pieces of apparatus responded, but personnel were unable to gain immediate access to the interior. A fire-cause investigation indicated that newspapers left on a hot plate may have started the fire. The challenge to firefighters of such a large aircraft when an internal fire occurs and there is no interior fire extinguishing system and no interior fire divisions is pointed out. The electrical wiring in overhead spaces is described as a particular hazard. The usefulness of the elevated stream device in fighting the fire from above is emphasized. (This article is an abridged version of a paper presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.) 2 figs, 2 photos.

25. NFPA Fire Record Dept
BIMONTHLY FIRE RECORD
Fire J; 71(1):43-46, 1977

Thirteen accounts of typical important fires reported to the National Fire Protection Association are presented. All the fires took place in 1976 in various types of occupancies, including utility, storage, manufacturing, residential, and public assembly. In some cases the accounts are based on preliminary reports, which are subject to verification. Given in most cases is a brief description of the premise, circumstances surrounding outbreak of the fire, fire-fighting tactics, investigative measures, damages and losses.

26. NFPA Fire Anal Dept
BIMONTHLY FIRE RECORD
Fire J; 71(2):43-46, 1977

Nineteen accounts of typical important fires reported to the National Fire Protection Association are presented. All the fires but one occurred in 1976 in various types of occupancies, including commercial, public assembly, manufacturing, storage and residential. In some cases the accounts are based on preliminary reports, which are subject to verification. Given in most cases is a brief description of the property, circumstances of the fire outbreak, fire-fighting tactics, investigative measures, damages and losses.

27. Chisnall B [*Fire Prot Assoc, UK, Tech Dept*]
CHANGING PATTERN OF FIRES IN THE HOME
Fire Prev; (119):24-30, 1977

This survey of UK statistics examines changes in the pattern of fires in the home. It shows that a substantial increase in the number of fires has been accompanied by a smaller increase in fatalities. More people are dying as a result of being trapped by fire, but to some extent this trend has been compensated for by a reduction in the numbers killed by ignition of their clothing. Underlying causes for these trends are examined. 6 figs, 8 tables, 15 refs. (Author)

28. Dietel K
ANALYSIS OF FIRES IN THE E280 STRAW CHOPPER AND TIPS FOR PREVENTING FIRES
Landtech Inf; 15(9):151-152, 1976 (German)

An analysis is made of the causes of fires in straw choppers. It has been found that most fires start in the electrical portion of the machines at weakened points of the wedge-shaped belt transmission system, circuits, etc. It is found that 75% of the fires occur in machines after repair. A list of damages leading to fires is given. Professional technical measures must be taken to prevent such fires and losses; in particular, the maintenance personnel must be well trained in regulations for handling and servicing, followed by a test of a minimum level of fire-protection knowledge. (RZh)

29. Kitagawa T
CAUSE ANALYSIS OF ACCIDENTS AND DISASTERS
Nihon Kikai Gakkaishi; 79(693):782-788, 1976 (Japanese)

The causes of accidents in factories, including fires and explosions in plants of the petrochemical and oil and gas industry, are analyzed and classified. Various industrial measures to increase the fire safety of production processes and peripheral equipment are compared as to their effectiveness. In particular, an analysis is made of the effectiveness of such measures as the packing and sealing of industrial apparatus: the collection of fire-hazardous products directly at the point where they are generated, eg, at tanks containing readily flammable liquids; the creation of oriented artificial convective flows to entrain fire-hazardous vapors or gases from production apparatus and from workshops to a safe place; reducing the fire hazard of materials by introducing into them or their atmospheres incombustible or refractory additives; and changing the temperature conditions of technological processes. It is noted that, according to the available statistical data, the greatest number of fires in factories is connected with improper use of electrical equipment. This emphasizes the fact that the improvement of electrical equipment in terms of its fire safety is the statistically most effective way of ensuring safety in these factories. In this connection it is emphasized that such measures as the avoidance of overloads, short circuits, sparking and electrical arcing during the operation of electrical equipment are of special importance. Electrical apparatus used in areas with a fire- and explosion-hazardous atmosphere must be reliably protected against the possibility of spark discharge during connection and disconnection of electrical circuits inside equipment. The design current loads on apparatus, wiring and cables must take into account the probability of heat-up of the apparatus and its component parts to temperatures corresponding to the autoignition temperatures of the ambient materials. It is noted that modern fire-safety engineering takes into account the necessity of safeguarding large production apparatus using electrical energy by two types of grounding devices: general grounding and also grounding to discharge static and atmospheric electricity during friction and storms. Also considered are some problems connected with ensuring the evacuation of personnel and property. 4 figs, 12 refs. (RZh)

30. Zabinski A and Halvorzen F
ANOTHER BIG BANG OUT OF CRUDE OIL
Saf Sea Internat; (92):25-27, 38, 1976

An accident report describes how an explosion occurred in an "empty" cargo tank on a single-skin petroleum tanker barge. The tank was actually not gas-free and the heat or sparks from hot work on an external tank wall ignited the flammable vapors within. Contributing causes of the accident were improper documentation of the cargo, failure by responsible personnel to have the tank certified gas-free, and failure of the yard workers to recognize an extremely hazardous situation. The circumstances of the accident are described, as are three other similar cases. The flammability and toxic properties of black and crude oils are discussed and regulations regarding handling of these oils are presented. Particular attention is devoted to the combustibility of the vapor mixture in tanks containing light and heavy oils and petroleum products. The fire and explosion hazards, determined by flash point and Reid vapor pressure tests, are discussed.

31. Tupova J and Wiegner P
CAUSES AND CONSEQUENCES OF VEHICLE FIRES
Tech Ueberwach; 18(3):101-103, 1977 (German)

From 0.1 to 0.5% of all traffic accidents are accompanied by vehicle fires. The proportion of fatalities in fire accidents is ten times greater than the average. By far most of the vehicle fires are not triggered by traffic accidents. The most frequent causes of vehicle fires are faulty fuel systems (30% of all the cases investigated), followed by defects in the electrical equipment (16%), tire fires (5%), fires as the result of a traffic accident (5%), and negligence in handling open fire (1%). These results from an investigation of the Institute for Safety Research in Highway Traffic of the Technical University of the Rheinland (FRG) are reported in this article. The investigation was supported within the framework of a study of "Technologies for Traffic Safety" by the Federal Minister for Research and Technology. 7 tables, 7 refs. (Author)

32. Anon
EXPLOSION OF CARBON-DIOXIDE FIRE EXTINGUISHERS
Verkehrsrundsch; (36):30, 1976 (German)

Recently cases have occurred in the FRG where the containers of carbon-dioxide fire extinguishers exploded without being affected by external destructive forces. The cylinders that exploded were made in the FRG from thermally improved Mn-Si steel before 1966. The capacity of the containers was 0.47-13.4 liters. The containers exploded because the material had been damaged by corrosion that attacked micro-cracks on the surface of the inner walls of the carbon-dioxide containers in conjunction with moisture and because the steel had become contaminated by nonmetallic inclusions and slag. The service life of the fire extinguishers, as established by an analysis of the causes of explosion, does not exceed 6 years from the day of manufacture. After six years of service the extinguishers must be subjected to pressure tests in accordance with existing standards and must then be refilled with carbon dioxide. (RZh)

33. Anon
SOME CASES OF FIRE CAUSED BY WELDING OR CUTTING
Weld World; 14(5-6):125-131, 1976 (English and French)

The principal causes of fires when operating welding and cutting equipment are identified as the direct effect of the flame or electric arc, thermal conductivity and sparks. Three examples of fire caused by welding or other hot work in a machine factory, a fabrication shop and store, and in a hospital are described and rules are deduced from the study of these fires. 8 figs.

34. Loomis WR
AIRCRAFT ENGINE SUMP-FIRE STUDIES. Nat Aeron and Space Admin, Lewis Res Center, Cleveland, OH; N77-18104, 12 pages, 1976

Results of ongoing experimental studies are reported in which a 125-millimeter-diameter-advanced-bearing test rig simulating an engine sump is being used to find the critical range of conditions for fires to occur. Design, material, and operating concepts and techniques are being studied with the objective of minimizing the problem. It has been found that the vapor temperature near a spark ignitor is most important in determining ignition potential. At temperatures producing oil vapor pressures below or much above the calculated flammability limits, fires have not been ignited. But fires have been routinely started within the theoretical flammability range. This indicates that generalizing the sump-fire problem may make it amenable to analysis, with the potential for realistic solutions. (This report is an extract from *Aircraft Safety and Operating Problems*, pp 443-456, 1976. For the primary document see N77-18081.) (Author)

e. FIRE SCIENCE EDUCATION

f. LEGISLATION

35. Aitken JE [*Marks and Spencer Ltd, UK*]
YOU COULD BE PROSECUTED NOW IF YOU HAVE A FIRE
Fire; 69(863):603-604, 1977

The implications of the UK Fire Precautions Act of 1971 and the Health and Safety at Work Act of 1974, which enjoins employers to provide reasonably practicable safe working conditions, are reviewed in terms of the measures that can be taken in fire prevention to satisfy the provisions of these acts.

36. Brannigan V [*US Consumer Product Safety Commiss, Washington, DC*]
THE LEGAL IMPLICATIONS OF MANDATORY HOME FIRE DETECTION
Fire J; 71(2):59-65, 1977

There is no general agreement on the implementation of a home fire detection plan. Some believe that the installation of home detectors should be mandatory, while others believe that a law requiring home detectors would involve governmental meddling into people's lives. The requirement to outfit single-family homes with smoke detectors involves a careful balance of the rights of individuals and those of society. Careful drafting of the statute is required to ensure that it provides an economical means of reducing society's loss from fire in the most equitable manner. (NFPA)

37. Bierlein LW [*Council for Safe Transportation of Hazardous Articles*]
SHIPPING HAZARDOUS MATERIALS
Household Pers Prod Ind; 13(5):80, 88, 1976

The implications of the new *Hazardous Materials Transportation Act* (signed by the President in January of 1975), such as the authority given to the Department of Transportation (DOT) to levy civil penalties, extension of DOT authority not only over shippers and carriers of hazardous materials, but also to makers and reconditioners of packaging, application of the law to much interstate and local traffic, centralization under DOT of the approach to regulation, and preemption of inconsistencies in local regulations, as they apply to manufacturers of household and personal products, are summarized in this reprint of an abbreviated talk given at the Soap and Detergent Association convention in Boca Raton, Florida, on June 29, 1976.

38. Ryan JV [*US Consumer Prod Saf Com, Dpty Fire Programs Off, Washington, DC*]
A CPSC FIRE PROGRAM
J Consumer Prod Flammability; 4(2):160-168, 1977

The CPSC (Consumer Product Safety Commission) administers fire statutes, four of which allow the establishment of regulations to counter hazards resulting from fire or flammability characteristics of materials or products. The CPSC must also recognize the statutory responsibilities of several other government agencies with regard to certain aspects of fire safety. To provide coordination, both internally, under the statutes administered by CPSC, and externally, with other agencies having major fire program responsibilities, the position of Fire Programs Officer was established by CPSC in March, 1976. This officer has taken up as priority matter the question of the flammability of upholstered furniture and has prepared a briefing package regarding the hazard and potential remedial strategies. The second priority is that of general wearing apparel , for which a briefing package is in the early stages of preparation. External coordination has taken the form of visits to other agencies to gain increased familiarity with areas of mutual interest. The acts, responsibilities, and activities of this program are discussed. (This article is based on a paper presented at the second International Conference on Fire Safety held at the University of San Francisco, California, from January 24 to 28, 1977.) 17 refs.

39. Walsky LS [*Nat Knitted Outerwear Assoc*]
THE LAW ON FABRIC FLAMMABILITY: A SUMMARY
Knitting Times; 45(5):20-22, 1976

Standards FF-3 and FF-5 relate to tests by which the flammability of fabrics used for infants' and children's sleepwear in sizes 0-6X and garments in sizes 7-14 are conducted; they were promulgated on 29 July 1973 and 1 May 1975, resp. Standard CS 191-53 applies to all other apparel, including infants' and children's garments other than sleepwear, and has been in effect since 1954. The modalities of these standards are described in detail in this article, covering guarantees and record keeping, sleepwear tests, sampling under FF-3 and FF-5, garment sampling, labeling, and state standards. Beginning 1 July 1979 no children's outerwear shall be sold or offered for sale if it does not meet FF-3 or FF-5 or an equivalent standard approved by the Fire Marshal.

40. Kobayashi T and Sato T
DISASTER PREVENTION APPARATUS AND THE FIRE FIGHTING LAW
Omron Tech; 16(2):79-85, 1976 (Japanese; English Summary)

The principal technical specifications are formulated for fire safety and fire warning systems according to the new firefighting law, which went into effect in Japan in January, 1975. Appropriate titles of the law regulate the classification of fire safety and fire warning systems as a function of the nature and various parameters of the premises for which these systems are designed. The law imposes more rigid requirements (compared to the corresponding standards presently in effect in Japan) on the service life, reliability, mean cycles between failures, repairability, restorability, and other technical and operational parameters of the systems. The permissible delay time for initiation of a fire outbreak signal, measured from the time the fire detectors are actuated, has been reduced considerably. The total time from the instant a fire starts until a warning signal is initiated or until a command is transmitted to the automatic fire extinguishing system for various types of warning systems ranges from 10 sec to 1 min. The main components of this time interval, corresponding to certain processes and operations in the signal transmission and processing path, are analyzed: the time lag to activation of the detectors, measured in units of time from the instant the ambient temperature exceeds a certain predetermined threshold value; the actuation time of various relays used in the signal transmission path; and the delay time required for the logic circuit to make a decision as to the start of a fire by processing the signals from the detectors and comparing them with reference signals. The block diagram and operating principle of a fixed fire warning system designed for operation in large production halls of industrial plants are described in detail. Possible ways of reducing the emergency warning delay time based on this system are analyzed. In particular, it is proposed that the use of the new electronic fire-warning system control unit containing integrated circuits and modular solid-state microcircuits will make it possible to reduce the emergency warning delay time by 15-20%. 5 figs, 3 tables, 10 refs. (RZh)

41. Kulow A [*Schwerin Fire Department, GDR*]
EXAMPLES OF FIRES AND OTHER VIOLATIONS OF FIRE SAFETY LAWS DURING WELDING AND CUTTING WORK AND THEIR PUNISHMENT
Schweisstechnik (Berlin); 26(9):426, 1976 (German)

Seven cases of welding and cutting fires that occurred in the German Democratic Republic during 1975 are described in brief, along with a citation of the various titles of the law that were violated, resulting in these fires and prosecution of the culpable parties.

42. Tennhardt R [*VEB BMK Chemie, GDR*] and Roebenack K-D
DISCIPLINARY AND MATERIAL RESPONSIBILITY FOR ENDANGERING HEALTH, LABOR, AND FIRE SAFETY
Schweisstechnik (Berlin); 26(11):506-509, 1976 (German)

In order to increase the legal safety and the sense of responsibility of the labor force in the German Democratic Republic, this article deals with the question of the duty of all workmen, not only supervisors, to observe all the safety regulations regarding health, labor and fire protection. Negligent or deliberate violation of these regulations, depending on the severity of the results, can be punished by disciplinary (reprimands) or by material (fines) actions under the provisions of the labor safety laws, which are cited in support.

43. Freeston MA [*Consumer Prod Saf Comm, Washington, DC*]
FEDERAL PREEMPTION UNDER THE FLAMMABLE FABRICS ACT
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 262-264
Sponsor: Information Council on Fabric Flammability

Under the amended Flammable Fabrics Act, whenever a Federal flammability standard is in effect, no state or local government may establish or continue in effect a flammability standard for the same fabric, product, or related material, designed to protect against the same risk of occurrence of fire, unless it is identical to the Federal standard. Two ways for states or local governments to have flammability requirements which would otherwise be preempted are stated. Regulations informing state and local governments how to apply for exemption from preemption and setting forth procedures to be followed when applications are submitted are also presented. A proposal of exemption from preemption for the State of California children's clothing flammability regulations is also examined.

44. Ollstein RN [*St Vincent's Hosp and Med Center, New York, NY*]
ONE MEMBER'S PERSPECTIVE ON THE NATIONAL ADVISORY COMMITTEE FOR THE FLAMMABLE FABRICS ACT
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 167-170
Sponsor: Information Council on Fabric Flammability

A member of the National Advisory Committee (NAC) for the Flammable Fabrics Act discusses the role of the Committee in relation to the Consumer Product Safety Commission (CPSC), to which the functions of the Department of Commerce with regard to the Act were transferred in 1973. Up for particular criticism is the failure of the CPSC to properly utilize the advisory capacity of the Committee. Nevertheless, the interested parties are encouraged to continue to provide input in fabric flammability through the NAC and through the Information Council.

45. Schongar LH [*Hooker Chemicals and Plastics Corp, Niagara Falls, NY*]
THE IMPACT OF THE TOXIC SUBSTANCES CONTROL ACT ON FLAME RETARDANT CHEMICALS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 209-220
Sponsor: Information Council on Fabric Flammability

The impact of the Toxic Substances Control Act, which provides for pre-market testing of new chemical substances as well as for the requirement of data on "old" products, particularly those suspected of causing or contributing to cancer, gene mutations, or birth defects, is considered. The specific regulations of the act, such as submission of toxicological testing data 90 days before manufacturing or processing a new chemical or processing an old chemical for a significant new use, the requirement that the data follow the testing rule for the product, if established, or that the data show no unreasonable risk to the environment, and other regulations, are reviewed. An attempt is made to clarify cloudy points in the regulations, such as whether textile fibers are chemicals, the question of the patents status of flame-retardant chemicals, definition of what a "small" manufacturer is, and others.

46. Anon
FEDERAL FIRE SAFETY REQUIREMENTS DO NOT INSURE LIFE SAFETY IN NURSING HOME FIRES. REPORT TO THE CONGRESS. Comptroller General of the

US, Washington, DC; HRP-0013092/2GA, 60 pages, Jun 1976

Federal fire safety requirements for nursing homes participating in Medicare and Medicaid are discussed in a report of the Comptroller General to the Congress. The report examines two fires in Chicago nursing homes that led to the deaths of 31 people early in 1976. Multiple deaths occurred in these and other fires even though the buildings were considered to be fire resistive and were in substantial compliance with Federal fire safety requirements. Investigation of the Chicago fires revealed that the deaths were caused by smoke and products of combustion rather than by flames. Neither facility was fully protected with an automatic sprinkler system designed to activate an alarm and begin combating the fire immediately. Neither the fire department, which responded promptly to both alarms, nor facility employees were able to prevent the deaths. This and other reports point up the need for and the benefits of automatic sprinkler systems in nursing facilities. It is estimated that the cost of sprinkler system installation ranges from $393 to $625 per bed. It is pointed out that, with the installation of a sprinkler system, savings on nursing facility fire insurance premiums are possible. Through reimbursement for depreciation and interest, Medicare and Medicaid will pay for part of the cost of installation. The report recommends that Congress enact legislation requiring all nursing facilities to be fully protected with automatic sprinkler systems. It is further recommended that the Department of Housing and Urban Development take steps to encourage the use of Federal Loan Insurance for the installation of fire safety equipment, a program hampered by excessive processing time and lack of publicity. Appended materials include a summary of pertinent congressional committee reports on fire safety in nursing homes, copies of the floor plans of the two Chicago facilities, and details of other nursing facility fires resulting in multiple deaths. (Available from the Government Accounting Office, Publications Section, 441 G St, NW, Room 4522, Washington, DC 20548.)

47. Anon

TRAGEDY OF MULTIPLE DEATH NURSING HOME FIRES: THE NEED FOR A NATIONAL COMMITMENT TO SAFETY. US House of Representatives, Select Committee on Aging, Washington, DC; HRP-0016461/6GA, 51 pages, Sep 1976

The rationale for enactment of Federal legislation requiring installation of automatic sprinkler systems in Medicare and Medicaid nursing homes is presented in a report to the 94th Congress. The study on which the report is based was prompted by the experience of Chicago, Ill. Two fires in Chicago nursing homes killed 32 people and injured 50 others, while a third was extinguished quickly, with no loss of life or injury, by an automatic sprinkler system. The City of Chicago then enacted an ordinance requiring all nursing homes to install sprinkler systems. Several reports, including one from the National Bureau of Standards of the Department of Commerce, are cited to demonstrate that automatic sprinklers are the best-known way to prevent multiple-death fires in nursing homes. The cost of requiring all nursing homes to be fully protected with sprinkler systems is estimated at $256 million to $412 million for the 8,000 Medicare and Medicaid nursing facilities (out of a total of 16,500) without sprinklers at the time of the report. The provision of direct Federal loans is viewed as the most expedient way to insure the availability of the $32,000 to $50,000 per facility required to install the sprinkler systems. Copies of related House bills are included. (Available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402, order no. 052-070-03714-8.)

g. PUBLIC EDUCATION AND INFORMATION

48. NFPCA

SMOKE DETECTOR RESOURCE CATALOG

US Dept Commerce, Nat Fire Prev and Control Admin; 39 pages, Jun 1977

To help meet the challenge and opportunity of a smoke detector campaign in communities, the National Fire Prevention and Control Administration has prepared a series of smoke detector public education manuals. Written in cooperation with the National Bureau of Standards, these manuals are largely based on successful local programs. The five manuals illustrate a coordinated effort within the NFPCA. Research, data, fire service training, and public education are all important elements of smoke detector activities. The first volume consists of a fact sheet on smoke detectors, guides to finding smoke detector materials, case histories of successful programs, a legislative overview, and evaluation techniques. (This volume is available from the NFPCA.)

49. Davies B [*Nottinghamshire Fire Service, UK, Dunkirk Fire Station*]

FIRE SAFETY TALKS FOR SCHOOLS

Fire; 69(861):522, 1977

The experience of a station officer in the UK in conducting a fire-safety program in schools as part of the curriculum, the props and techniques used to enliven the program, and public-address postures to be assumed in a school-audience atmosphere are narrated.

50. Crossman ERFW, Zachary WB [*Univ of Calif (Berkeley)*] and Pigman W

A FIRE RISK AND READINESS STUDY OF BERKELEY HOUSEHOLDS, 1974

Fire J; 71(1):67-73, 1977

To assist in the planning and design of an efficient, cost-effective fire protection system, questionnaires were distributed to 3,500 households in Berkeley, California, to develop the required information. The questionnaire included questions on fire hazards, fire preparedness, fire incidents, fire safety policy, and household characteristics. There were extinguishers in 32.2% of the households and detectors in 2.6%. The households rely largely on their own efforts for fire protection, with the fire department providing backup. Fire prevention and control activities should be concentrated on providing information and education related to fire suppression techniques. (This article is an address presented by the authors to the 79th NFPA Annual Meeting held on May 12-16, 1975, in Chicago, IL.) 9 tables, 2 refs. (NFPA)

h. RESEARCH AND DEVELOPMENT PROGRAMS

51. Chironis NP
BUREAU INTENSIFIES EFFORTS TO DETECT AND SUPPRESS FIRE IN MINES
Coal Age; 81(9):110-115, 1976

A review is made of the efforts being applied by the Bureau of Mines to detect and control fires in mines and on surface mining equipment. An automatic fire protection system has been developed for surface mining equipment that uses potassium bicarbonate as the extinguishant in nitrogen-pressurized cylinders, with manual override. A supersensitive smoke detector, a submicron particulate detector capable of detecting incipient fires, has been developed for underground workings. Also described are a triple-band IR flame detector, a mine fire-gas analyzer, new methane monitors, a CO detector with miniature fuel cell, a CO tube bundle monitoring system, and mine coatings and conveyor belts, as well as remote sealing of mine fires with fly-ash filling and foam toppings. 11 figs.

52. Buerger A
FIRE RESEARCH
Feuerwehr; 26(10):294, 1976 (German)

The Federal Ministry for Science and Technology of the FRG has organized a special committee for coordination of research being conducted in the field of fire protection. An annual report will be presented to the Ministry. The organizing meeting of the committee was held in September, 1976. Seven research projects are planned. The committee is made up of six leading specialists of the professional fire service, six representatives of scientific and insurance associations, and the director of the Fire Service Training Center of the FRG. The General Director of the Munich Fire Department was named chairman of the committee. Among the research projects proposed at the first meeting are the following: the use of a C-160 aircraft for firefighting as a transport plane to deliver water (13.5 tons of water per load) at the fire scene and to discharge it by means of a special device in a period of no more than 5 sec; testing of new methods of control of operations; fire reconnaissance, and fire inspection to develop a command center with the most modern equipment, which could guarantee highly efficient fire protection under various conditions, including disaster situations; fundamental research proposed by various municipal councils in the FRG to optimize the fire protection work, to coordinate the activities of the professional and voluntary units, and also to develop improved fire apparatus and technical equipment; research into the combustion processes of high polymers; the development and testing of new fireproof insulating materials resistant to gas diffusion; research in the area of fire safety and gas supply (municipal gas lines); and research and development of rescue systems in buildings with a large number of occupants. Seven and one-third million marks have been set aside for this research. Additional funds amounting to about 10% of this total will be contributed by the states. (RZh)

53. Nice G [*Fire Res Sta, Borehamwood, UK*]
FIRE RESEARCH VIEW ON EXPANDED POLYSTYRENE
Fire; 70(865):81-83, 1977

This article, which is extracted from a paper presented at an international conference on expanded polystyrene (EPS) held at Brighton, UK, attempts to give a broad overview of research relevant to the behavior of EPS in fire now in progress at the UK Fire Research Station. Very little of its work is directed toward the actual properties of specific materials as such; the emphasis is on performance rather than properties. The work is being done under four headings: 1) statistical aspects; 2) combustion products; 3) behavior of manufactured items; and 4) real fire experience. The pertinent research in these areas is reported. 7 refs.

54. Anon
CONCEPTS FOR FIGHTING FIRE
Nat Saf News; 115(6):65-69, 1977

The efforts of this year's Student Design Program sponsored for university students by the Armco Steel Corporation, in which work was carried out on various aspects of firefighting ranging from turnout clothing to a firefighting hovercraft, resulted in some interesting approaches to old problems, as reported in this article. The results are presented in sections relating to personal clothing, training, equipment, vehicles, and other devices, such as escape doors for mobile homes, smoke-detector-actuated fire curtains, fire-fighting methods for homes, hotels, or apartments, wide-dispersion nozzles for fire extinguishers, among others. 10 photos.

55. Rinsen M
TESTS CARRIED OUT BY THE FIRE SCIENCE LABORATORY IN 1975
Fire Sci Lab Japan. Rep; (13):144-146, 1976 (Japanese)

Statistical indexes are given in tables to characterize quantitatively the fire research and tests carried out in 1975 according to a topical plan by the Fire Laboratory of the Tokyo Section of the Fire Engineering and Fire Methods Research Institute and also to classify the studies and tests by various characteristics. They were classified in particular according to the purposes for which the tests were conducted, eg, determining the effectiveness of new extinguishants, evaluating the quality of fire-resistant, thermally stable varnish and paint coatings, calculating and assessing the fire safety of various building and industrial structures and equipment and the fire safety of new materials and fuels, etc. 8 tables. (RZh)

56. Otani H
FIRE PREVENTION IN TRAINS
Sharyo to Denki; 27(8):6-10, 1976 (Japanese)

Statistical data have been compiled in graphs to illustrate the number of railroad fires that occurred in Japan in the period 1950-1975 and the number of casualties and the magnitude of the material losses. This period is characterized by uniform indicators in all the aspects of the evaluation, except for the 2-year period 1960-1962, when a sharp increase in the number of railroad fires was observed. This is explained by the introduction during this period of high-speed electric locomotives, which present a greater fire hazard, and also by the construction of four long railroad tunnels, including the Hokuriku tunnel, each more than 5 km long. In the initial period of operation (1959-1961) these tunnels were not equipped with reliable automatic fire detection and suppression systems. The principal advances made in Japan in the area of prevention of railroad fires are briefly described. A report is also made on the most promising research and development trends in this area for the next ten years. 1 fig, 3 tables. (RZh)

57. Otani H
FIRE PREVENTION IN TRAINS
Sharyo to Denki; 27(9):4-6, 1976 (Japanese)

The level of fire safety in trains in Japan in the last 10 years is analyzed. A sharp increase in research in this field in the last 4 years has been noted as a result of the comparatively large number of railroad fires with severe losses during the period 1969-1973. All the organizational and technical measures are classified in the following principal categories: train speed from the viewpoint of fire safety; development of fixed linear fire equipment especially for railroads; development of fixed railroad emergency communications and fire alarm systems; development and perfection of highly effective fixed automatic fire detection and extinguishing systems designed for use in railroad tunnels; development of fire equipment for electrical locomotives and various types of cars, including emergency ventilation and life safety systems; training of railroad personnel in fire safety, including examinations at various levels. All the work connected with theoretical research to increase fire safety in trains is evaluated. (RZh)

58. Marbery CA [*Plastics Pipe Inst*]
FIRE SAFETY RESEARCH CONDUCTED BY THE PLASTICS PIPE INSTITUTE
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 165-173
Sponsor: Fire Retardant Chemicals Assoc

A slide presentation is given of the research initiated by the Plastics Pipe Institute at Ohio State University to answer the many questions being asked in regard to the fire performance of plastic pipes, which revealed that plastic pipe can be put into rated construction. Additional testing was begun at the University of California at Berkeley to develop methods for installing plastic pipe in rated construction and to protect penetrations in rated assemblies. The most practical and economic protection was found to be a sheet metal shield. The pertinent codes, the affected products, the new requirements being imposed, and other problems relating to plastic pipes are outlined.

59. Durbetaki P, Tincher WC, Chang H, Teague ML, Ndubizu CC and Wolfe VL, Jr
EFFECTS OF IGNITION SOURCES AND FIRE RETARDANTS ON MATERIAL IGNITION. QUARTERLY PROGRESS REPORT NO. 9. Georgia Inst Technol, School Mech Eng, Fire Hazard and Combust Res Lab, Atlanta, GA; Unnumbered Report, 34 pages, 5 figs, 5 tables, 14 refs, Jul 1977

Ignition studies on thermally thin fabrics and thermally thick materials (furniture, interior decorations, building materials) are being carried out with a combined experimental and analytical program in the Fire Hazard and Combustion Research Laboratory of the School of Mechanical Engineering at Georgia Institute of Technology. The objectives of the current program are: 1) to study the effect of flame retardants on the preignition processes and the ignition time; 2) to study the ignition/destruction of unrestrained fabrics; 3) to investigate the effect of convective source type and size on the ignition time of materials; and 4) to modify and extend the modeling analysis for the prediction of ignition time. Fabrics have been chosen and flame retardant treatments and levels selected for the study of the effect of flame retardants on preignition processes and ignition times. Both condensed phase active and gas phase active retardants are under study. Treated fabrics are scheduled for preparation in the pilot plant at the USDA Regional Laboratory in New Orleans. Characterization of the microburner has been carried out with heat flux measurements. A polyester-cotton blend fabric has been used to conduct ignition frequency measurements. Thermal radiative property measurements were carried out with six fabrics. These properties were measured both on original and charred samples. The materials were charred by exposing them to a time-invariant and uniform radiant heat source at different intervals of exposure time. The modeling analysis on ignition of materials under forced convective heating has been used to carry out numerical calculations with a thermally thin material. Pyrolyzate ignition time was found using the gas phase ignition criterion. Time histories of solid temperature, solid decomposition, boundary layer temperature profiles and boundary layer pyrolyzate mass fraction profiles were evaluated. (Author)

2. DYNAMICS AND MECHANICS OF FIRE

a. FIRE BUILDUP, PROPAGATION, AND SPREAD

60. Takita M and Kita H
MODEL STUDY OF FIRE DYNAMICS IN RAILWAY TRAINS
Tetsudo Gijutsu Kenkyu Shiryo; 33(9):338, 1976 (Japanese)

A brief description and partial results of a study of the process of fire development in railway trains which was carried out under laboratory conditions using a mock-up simulator are presented. The design and parameters of the simulators and test stand used in the studies are described. Tested in particular were mock-ups of railway cars measuring 90, 180, 260, 360, and 450 cm in length. During the studies the mock-ups were placed in a wind tunnel that simulated train motion at various speeds by varying the velocity of the axial air flows. The test-stand design permitted maximum approximation of real conditions in the equipment; in particular, the temperature reached 900-1000°C at individual points where the mockups were burned. Special attention was devoted to accurate evaluation of the quantitative and qualitative parameters of the process of smoke release and the generation of toxic gaseous combustion products, CO and CO_2. The high reproducibility of railway train fires using mock-ups under laboratory conditions is emphasized. 2 figs. (RZh)

2. DYNAMICS AND MECHANICS OF FIRE

a. Fire Buildup, Propagation, and Spread—Continued

61. Alpert RL, DeRis J, Modak AT, Mathews MK, Markstein GH, Orloff L, Land RI, Farren E, Polo JC, Mann DS, Kiley FB and Crudup L
INFLUENCE OF ENCLOSURES ON FIRE GROWTH. VOLUME 1: TEST DATA. TEST 0: BASIC CONFIGURATION. Factory Mutual Res Corp, Norwood, MA; FMRL OAOR2.BU-0, 49 pages, 14 figs, 6 tables, 8 graphs, Jun 1977

The full-scale fire test program is a part of the Harvard-Factory Mutual Home Fire Project. The program is an outgrowth of three realistic enclosure fire tests performed in 1973, 1974 and 1975. These three previous tests have stimulated development of comprehensive mathematical models for predicting room fire behavior. The principal objective of the present program is to provide a body of full-scale test data for evaluating these mathematical models of room fire development. Sufficiently verified mathematical models may then be expected to economically predict room fire behavior as a function of basic flammability properties of the materials within the room. A standard room enclosure 2.4 m x 3.7 m x 2.4 m high with a corridor extension is used in this test program. This brief data report documents the room geometry and physical layout of the initiating (medium-density, horizontal polyurethane foam slab; a horizontal, 368 mm dia, fuel-level controlled pan of polymethyl methacrylate pellets; and a horizontal 711 mm dia pan of polymethyl methacrylate pellets) and target (polyurethane foam and lightweight targets such as pieces of paper) items. Basic flammability properties of the initiating item, the test conditions, the fire chronology, a signal identification table with comments on signal fidelity and some selected graphs are documented here. An abbreviated data table of results at 12 selected times is also provided. The complete set of data is on the enclosed microfiche. The complete set of data and front end program is also available on an industry compatible nine-track 800 or 1600 bpi (bits-per-inch) magnetic tape as described in the accompanying report program documentation. The data may be obtained by sending a magnetic tape (minimum length 150 m (500 ft) for one test and 720 m (2400 ft) for the series) and a written request (specifying the type of computer) to the authors. (Author)

62. Alpert RL, DeRis J, Modak AT, Mathews MK, Markstein GH, Orloff L, Land RI, Farren E, Polo JC, Mann DS, Kiley FB and Crudup L
INFLUENCE OF ENCLOSURES ON FIRE GROWTH. VOLUME 1. TEST DATA. TEST 1: BASIC CONFIGURATION. Factory Mutual Res Corp, Norwood, MA; FMRL OAOR2.BU-1, 49 pages, 14 figs, 6 tables, 8 graphs, Jul 1977

This test is part of a research study on the influence of enclosure geometry and scale on fire growth for cellular plastics. It is a part of the Home Fire Project being performed jointly by FMRC and Harvard University. The principal objective of the present program is to provide a body of full-scale test data for evaluating the mathematical models of room fire development. Each test is designed to address a specific issue. Eight tests are planned and sponsored by Products Research Committee as a part of a research program on the flammability of cellular plastics. The first three tests (0, 1 and 2) are performed with a basic room configuration to provide base-line data. This report documents room configuration and data of Test 1. Later reports will provide detailed analyses of these tests, as well as new mathematical models of fire growth. (Author)

b. FLAMMABILITY, IGNITION, AND EXTINCTION

63. Hirst R, Farenden PJ [*Graviner Ltd, UK*] and Simmons RF
THE EXTINCTION OF FIRES IN AIRCRAFT JET ENGINES — PART II, FULL-SCALE FIRE TESTS
Fire Technol; 13(1):59-67, 1977

Since a pool of fuel burning behind an obstruction is the most difficult aircraft engine fire to extinguish, the maximum concentration of agent required to extinguish a simulated burning pool of fuel was used as a basis on which design concentrations of extinguishing agents should be decided. Halon 1011 and Halon 1001 were used as extinguishing agents in full-scale jet engine fires in a wind tunnel. The fires were always extinguished with a lower concentration of agent than was required for the extinction of a pool of fuel burning under its optimum conditions. With Halon 1001, concentrations higher than 7.8% are recommended for the extinguishing system design. (Part I of this article was abstracted in *FTA*, 1(6), 1977; consult the Source Index under *Fire Technol*, 12(4):266-275, 1976.) 4 figs, 3 refs. (NFPA)

64. Dyer JH [*Graviner Ltd, UK*] and Simmons RF
THE EXTINCTION OF FIRES IN AIRCRAFT JET ENGINES — PART III. EXTINCTION OF FIRES AT LOW AIRFLOW
Fire Technol; 13(2):126-138, 1977

The most stable flame in an aircraft engine fire occurs in fuel that has collected in a pool behind an obstruction in the airflow. In tunnel tests with air velocities below 10 fps, the amount of agent required to extinguish a liquid surface diffusion flame burning behind a flame holder was determined. Concentrations required to extinguish the most stable flame were 7.8% for methyl bromide, 5.8% for bromotrifluoromethane, 6.5% for bromochlorodifluoromethane, and 42.5% for nitrogen. These values represent the lowest concentration of each constituent that could be used in a fire protection system for aircraft engines. (For Part I of this series, consult the Source Index of *FTA*, 1(6), 1977, under *Fire Technol*, 12(4):266-275, 1976.) 7 figs, 1 table, 10 refs. (NFPA)

65. Ahmad T and Faeth GM
AN INVESTIGATION OF THE LAMINAR OVERFIRE REGION ALONG UPRIGHT SURFACES. PA State Univ, Mech Eng Dept, University Park, PA; ASME 77-HT-68, 9 pages, 10 figs, 2 tables, 12 refs
Availability: ASME

Numerical calculations allowing for property variations are presented for the laminar overfire region along an upright burning surface under natural convection conditions. The process was also examined experimentally, using wicks soaked with methanol, ethanol, and propanol to simulate the burning portion of the surface. Flame shape and wall heat flux were predicted accurately for various wall inclination angles, except near the tip of the flame where the reaction is quenched by the cold wall.

The wall heat flux is nearly constant in the region where the flame is present, but declines quite rapidly beyond the tip of the flame. The position of the onset of turbulence was determined, using shadowgraphs. For transition beyond the tip of the flame, laminar flow was generally observed for $Gr_x' < 0.5 - 2 \times 10^8$. (Contributed by the Heat Transfer Division of The American Society of Mechanical Engineers for presentation at the AIChE-ASME Heat Transfer Conference, Salt Lake City, Utah, August 15-17, 1977. Manuscript received at ASME Headquarters April 20, 1977.) (Author)

c. FLOW OF COMBUSTION PRODUCTS

66. Bullen ML [*Bldg Res Establ, UK, Fire Res Sta*]
THE EFFECT OF A SPRINKLER ON THE STABILITY OF A SMOKE LAYER BENEATH A CEILING
Fire Technol; 13(1):21-34, 1977

A study has been made of the action of sprinkler sprays on hot buoyant smoke layers, with particular reference to covered shopping complexes, to quantify the possible danger of bringing smoke down to a low level and thus impeding or preventing the escape of occupants. Where the smoke layer is deep, approximately 1 m, a layer that is hot enough to fuse sprinklers will have sufficient buoyancy to withstand the downward drag of the sprinkler spray. Downflow may only occur later in the course of the fire when the layer is cooler, by which time the occupants should have escaped. 7 figs, 1 table, 11 refs. (NFPA)

67. Kojima M, Matsuhashi S and Torii S
STUDY OF THE CONTROL OF THE MOTION AND SPREAD OF SMOKE AND GASES
Fire Sci Lab Japan. Rep; (13):77-99, 1976 (Japanese)

Given are the results of laboratory studies designed to simulate fire conditions in multistory buildings with different floor plan configurations using various models. A special aerodynamic test stand was devised to generate the convective air flows characteristic of fires in large buildings of this configuration. It is pointed out that in order to create simulated fire conditions with a model that are maximally close to real fire conditions in a quantitative sense, an aerodynamic test stand must be used, because the process of burning a small-scale model differs qualitatively from the process of combustion of a large installation. As a result of the lack of correspondence between the micro- and macroconditions in which combustion of the model and an actual building occurs, the intensity and vector characteristics of the convective flows of smoke and toxic gases generated during combustion with respect to their values for the cases of the model and the actual building do not correspond to the value of the ratio of the sizes of the model and real building. In particular, at a 1:30 size ratio of model and building, the ratio of the values of the combustion-generated convective flows fluctuates from 1:100 to 1:10,000. Graphs and tables are given to illustrate the various characteristics of the spread of fire, smoke, and toxic gaseous combustion products. 50 figs, 9 tables. (RZh)

68. Dendyuk GV and Dal'kevich VM
METHOD OF DETERMINING THE DEGREE OF SMOKE CHARGING OF THE ATMOSPHERE
USSR Patent No. 492,289; Cl A62C 39/02, Appl 16 Jul 1974, Discl. 10 Mar 1976, Assignee: VNII Gornospasat Dela

A description is given of a method of determining the degree of smoke charging of the atmosphere. The method is based on the use of a lamp and two observers located some distance apart. In order to increase the accuracy of determination, a white disk with concentric black rings, each with a gap, is set up in the smoke-charged atmosphere ahead of the observers; then a beam of light from the lamp is projected onto the disk and the degree of smoke-charging of the atmosphere is determined from the visibility of the interrupted black rings on the disk.

69. Yang KT and Chang LC
UNDSAFE-1: A COMPUTER CODE FOR BUOYANT FLOW IN AN ENCLOSURE. Notre Dame Univ, Dept Aerospace and Mech Eng, South Bend, IN; TR-79002-77-1, NBS GCR-77-84, 106 pages, Mar 1977
Availability: NTIS PB-267 278/0GA

This report describes a numerical computer code known as UNDSAFE-1 for predicting the flow, temperature and pressure fields in a simple two-dimensional rectangular enclosure due to a volumetric heat source. It accommodates either a doorway or a window, and a variety of conditions such as location, extent and strength of a heat source, and various thermal boundary conditions along the ceiling and the floor of the enclosure. Physical effects taken into account in this code include strong buoyancy, compressibility, and turbulence. The code is fully documented and explained in this report in terms of input data and format, as well as available output options. A complete numerical example is presented. (Author)

d. INSTRUMENTATION, METHODOLOGY, AND DATA PROCESSING

70. Cox G [*Fire Res Sta, Borehamwood, UK*]
GAS VELOCITY MEASUREMENT IN FIRES BY THE CROSS-CORRELATION OF RANDOM THERMAL FLUCTUATIONS — A COMPARISON WITH CONVENTIONAL TECHNIQUES
Combust Flame; 28(2):155-163, 1977

Thermal fluctuations, detected by thermocouples, are employed as natural tracers to determine gas flow velocities in fire gases channelled under a ceiling. Measurements have been made in smoke and flame (up to 1000°C) in the velocity range 1-5 m/s. Results obtained using this cross-correlation technique have been compared, where possible, with more conventional methods and show reasonable agreement (within 10% with pitot tube and drum camera methods and better than 20% with a water-cooled vane anemometer). 9 figs, 2 tables, 16 refs. (Author)

71. Croce PA [*Factory Mutual Res Corp, Norwood, MA*]
A METHOD FOR IMPROVED MEASUREMENT OF GAS CONCENTRATION
Combust Sci Technol; 14(4, 5, 6):221-228, 1976

2. DYNAMICS AND MECHANICS OF FIRE

d. Instrumentation, Methodology, and Data Processing—Continued

A method is described for improving the transient gas concentration measurement in a relatively fast-developing fire or in any changing environment with a characteristic transient time that is comparable to the response time of the sampling system (including analyzer). Under such conditions, the measurements can be significantly altered in both time and magnitude and, hence, be of limited usefulness. The method utilizes the result of a simple laboratory test – the response of the measuring system to a step input – to determine the sampled concentration history from the analyzer record. 8 figs, 5 refs. (Author)

72. Gaskill JR, Taylor RD, Ford HW, Jr and Miller H [*Univ Calif (Livermore), Lawrence Livermore Lab*]
DEVELOPMENT, CALIBRATION, AND USE OF A HIGH-FLUX HEATER IN THE NBS/LL SMOKE CHAMBER
J Fire Flammability; 8(2):160-179, 1977

We have developed a stable, radiant heat source and calibrated it over the range of 2 to 13 W/cm². The source is capable of determining the smoke-density development of two commonly used woods at various heat fluxes with and without piloted ignition in both a closed (NBS-type) chamber and also under four ventilation rates. The results of the tests on wood specimens indicate that a radiant flux of 5 W/cm² or greater induces rapid pyrolysis and the generation of light-obscuring particulates, resulting in higher smoke opacities than has been anticipated, even though the specimens tend to autoignite at this flux and do autoignite at higher fluxes. At these flux levels, even when piloted ignition is used, combustion seems to be inefficient judging by the dirty orange color of the flames. Mild ventilation of the chamber seems to increase the maximum smoke opacities; higher ventilations tend to clear away the smoke particulates. The variable heat-flux and ventilation capabilities of the chamber system may yield a unique approach to the evaluation of autoignition phenomena for various materials. 15 figs, 4 tables, 9 refs. (Author)

73. Smith EE [*Ohio State Univ (Columbus), Dept Chem Eng*]
RELEASE RATE TESTS AND THEIR APPLICATION
J Fire Flammability; 8(3):309-323, 1977

The purpose of this paper is to examine release rate data in terms of testing procedures and the interpretation of these data. It is not a comprehensive review of specific equipment and testing procedures, but a discussion of concepts that have been used in design of release rate systems. The significance and applicability of release rate data depends on the test procedures used and interpretation of the information obtained by these test procedures. Hopefully this paper will at least explain if not reconcile the differences and disagreements that have arisen regarding the meaning and "purity" of release rate data. 8 figs, 4 tables, 8 refs. (Author)

74. DeRis J and Mathews MK
A VERSATILE COMPUTER PROGRAM FOR REPORTING FIRE TEST DATA. Factory Mutual Res Corp; FMRC RC77-B7-6, 39 pages, 1 fig, 3 refs, Jul 1977

This program is written and documented to facilitate broad dissemination of the FMRC-Harvard test data in cooperation with the NBS coordinated Ad Hoc Working Group on Mathematical Fire Modeling. The program reads the FMRC-Harvard data tapes and generates four output tables: 1) general test description; 2) signal description and commentary table; 3) data table; and 4) a sample user array for mapping data into a user-generated analysis program. The data table lists the scan times in the first column, followed by ten signal data columns for 8 1/2 x 11 in. page reproduction. Several options are available: 1) the signals can be printed in arbitrary order; 2) any selected scans can be skipped to create a more compact table; 3) modifications are shown for use on an 80 column printer; or 4) modifications are shown for compactly printing 15 signals per page. A user's guide provides detailed instructions for using these options. The program employs object time formatting with the column headings, units and data formats being read in as data records at time of use. This makes the program quite general and suitable for other fire test applications. The tape construction is also documented here. The program is written in standard ANS-1966 FORTRAN with Holerith literals enclosed in apostrophes (not quotes) and use of the common "ERR" and "END" reading commands. The program and method of tape preparation are being submitted to the Ad-Hoc Working Group Subcommittee on Computer Interchange for discussion as a candidate standard. (Author)

e. METEOROLOGY

f. RADIATION

75. Quintiere J, McCaffrey BJ and Kashiwagi T
A SCALING STUDY OF A CORRIDOR SUBJECT TO A ROOM FIRE. Nat Bureau Standards, Washington, DC; ASME 77-HT-72, 13 pages, 12 figs, 2 tables, 16 refs
Availability: ASME

A study was made of the thermal and flow environment within a corridor subject to a room fire of intensities of approximately 300 to 1500 kW. A corresponding model study was done under 1/7 geometric scale. Dimensionless groups were derived from the conservation equations governing the gas and solid phases. A subset of dimensionless groups was identified as significant to establish criteria to maintain partial dynamic scaling between the model and prototype experiments. Good results were achieved between the model and prototype for the convective process, ie, gas temperature, velocity, and convective heat transfer. Radiant heat transfer did not scale, but an analysis of the data explains the lack of agreement in terms of dimensionless groups that were not preserved in scaling. A secondary result yielded corridor convective heat transfer coefficients that could be correlated by a general relationship. (Contributed by the Heat Transfer Division of the American Society of Mechanical Engineers for presentation at the AIChE-ASME Heat Transfer Conference, Salt Lake City, Utah, August 15-17, 1977.) (Author)

g. THERMAL CONDUCTIVITY

3. BEHAVIOR AND PROPERTIES OF MATERIALS

[For literature on fire and flame retardants, fire and flame proofing, etc see ***Chemical Abstracts***.]

a. CHARACTERISTICS AND THERMAL BEHAVIOR OF MATERIALS

76. Irace A
ONE ASPECT OF FIRE PROTECTION: THE "FIRE BEHAVIOR" OF MATERIALS
Antincend Protez Civ; 28(2):99-102, 1976 (Italian)

In some cases fire-protection interests require the use of materials that have a low fire hazard. The degree of fire hazard of a material depends on its so-called "fire behavior," by which is meant the overall combustion characteristics of the material, such as the flammability, the rate of flame propagation over the surface of the material, the heating value, and the rate of heat liberation during combustion, the generation of smoke, and toxic gases. What is meant specifically by these characteristics is explained and their relative importance in determining the fire hazard of a material is discussed. It is pointed out that there is a lack of satisfactory methods of determining fire behavior. 2 figs. (RZh)

77. Peradejordi GJ de C
FIRE BEHAVIOR OF TEXTILES
ASELF; (56):35, 37-39, 41, 1976 (Spanish)

At the last meeting of the ISO in Paris the problems of coordinating research and standardization of the existing methods for three types of tests, namely, flammability, smoke generation, and toxicity, were solved. Textiles are divided into 6 classes in accordance with their degree of combustibility: incombustible (M0), inflammable (M1), difficultly flammable (M2), moderately flammable (M3), readily flammable (M4), and highly flammable (M5). Different types of tests are conducted as a function of the thickness of the material (up to 0.5 cm – group A; above 0.5 cm – group B). The following types of tests are used for group A materials: the basic test is in an alcohol flame; additional tests (for flammability) on an electric heater; and a test for the flame propagation velocity. For group B textiles the basic test is the radiative heat flammability test. The methods of these types of tests are outlined. (RZh)

78. Peradejordi GJ de C
FIRE BEHAVIOR OF TEXTILES
ASELF; (57):83, 87, 89, 1976 (Spanish)

Textiles, both natural and synthetic, belong to the class of highly flammable materials. The minimum energy required to ignite fabrics is 6-12 micro Joules. During combustion the fabric decomposes, forming combustible gases, promoting rapid fire spread. One of the first pyrolysis products of textiles is hydrogen, which changes instantly into the gaseous state, making it possible for the oxidation of carbon. The combustion mechanism depends on the chemical nature of the fibers and the burning conditions. The types of textile fire tests to be applied depend on the type of material and its thickness. The effect of flame from an alcohol burner is used for flexible textiles no less than 5 mm thick. In this test the area of fabric destroyed by fire is determined, but the quantity of gas released is not recorded. Textile materials more than 5 mm thick are subjected to fire tests in which the quantity of gas released is measured. Also conducted are tests which permit determination of the rate of flame propagation in the horizontal direction, as well as the tendency to form droplets when burning, which may serve as a source of further spread of the fire. 3 figs. (RZh)

79. Pickett A
POLYMERS AND FIRE: THE COST OF COMFORT
Br Plast Rubber; (1):36-39, 1977

The effort to conserve fuel has led to the insulation of buildings with plastics foam boards, glass fiber, mineral wool, and other materials, which, when tested separately, did not appear to offer any serious risk. Subsequent events have shown that in certain applications and under certain conditions they may temporarily increase the evolution of smoke and toxic combustion products in the event of fire. Design defects and the way panels are applied may explain the extent of their contribution to fires. Some pressure has been brought to bear to restrict the use of certain kinds of foamed plastics. Some of the conflicting views are summarized in this article in support of a suggestion for the introduction of a comprehensive voluntary informative labeling scheme. 2 figs, 2 tables.

80. Anon
FACTORS TO BE CONSIDERED IN THE USE OF PLASTICS IN BUILDINGS
Fire Prot Rev; 40(441):21, 25, 27, 1977

The increasing use of plastics in building construction has led to concern about the possibility of a consequent increase in fire hazard. Fire hazards can be minimized if the fire behavior of combustible materials is understood so that they can be used with due regard to their suitability for particular purposes. Light is shed on the problem in this article, which is a review of a current paper by BFW Rogowski published by the Building Research Establishment (UK) as CP 39/76 "Plastics in Buildings-Fire Problems and Control." For a review of this paper, see abstract 1134 in *FTA* 1(4).

81. Affens WA, Carhart HW and McLaren GW [*Nav Res Lab, Washington, DC*]
VARIATION OF FLAMMABILITY INDEX WITH TEMPERATURE AND THE RELATIONSHIP TO FLASH POINT OF LIQUID HYDROCARBONS
J Fire Flammability; 8(2):152-159, 1977

Flammability indices of vapor-air mixtures above liquid hydrocarbons at various temperatures were determined by means of a hydrogen flame ionization detector system that had been developed for this purpose. The relationship between flammability index (E) and temperature was found to be in agreement with equations derived from theory. Graphs of the data, plotting Log E vs reciprocal temperature, were linear and intersection of the lines with the zero ordinate ($E = 1$) gave temperatures that were in good agreement with flash points for pure hydrocarbons, for mixtures of hydrocarbons, and for fuels. 1 fig, 1 table, 9 refs. (Author)

82. Brauman SK [*Stanford Res Inst, Polymer Sci Group*]
EFFECT OF SAMPLE TEMPERATURE ON COMBUSTION PERFORMANCE OF POLYMERS
J Fire Flammability; 8(2):210-224, 1977

Poor correlation between different combustion test results can be attributed in part to the difference in thermal environments experienced by the polymer tested. Our study has shown that sample temperature profiles vary with the type of combustion test used and polymer tested, causing fuel production to vary and making combustion performance difficult to predict. We studied the effect of varying thermal environment on burning, flamespread, and extinction by systematically changing the heat input to or heat loss from the polymer. The polymers tested were, generally, polypropylene, polystyrene, a linear polyester, a crosslinked polyester, and polyvinyl chloride. The relative flammability ranking of materials was found to depend on the thermal environment used for comparison; the combustion behavior of some materials such as char-forming polyvinyl chloride showed a complex dependence on heat input. 10 figs, 1 table, 22 refs. (Author)

83. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
HYDROCARBON CONCENTRATIONS IN FIRE TOXICITY TESTS AS AN INDICATION OF FLASH FIRE PROPENSITY
J Fire Flammability; 8(2):235-240, 1977

The concentrations of hydrocarbons in the gases from fire toxicity tests are often determined to obtain an indication of their contribution to toxic effects and of the mechanisms of thermal decomposition. Because the gas compositions produced in the USF/NASA toxicity screening test are generated under identical pyrolysis conditions, they offer the potential of comparing flash-fire propensity of various materials. 4 tables, 5 refs. (Author)

84. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
A SIMPLE LABORATORY METHOD FOR DETERMINING FLASH FIRE PROPENSITY OF MATERIALS
J Fire Flammability; 8(3):332-348, 1977

A simple laboratory method for determining flash fire propensity of materials is described. The apparatus consists of a tube furnace and a combustion tube. The ignition source can be a wooden match but the hot pyrolysis tube itself may be the most suitable ignition source. Test results are presented for various materials including polyethylene, polystyrene, polycarbonate, and polyurethane and polychloroprene flexible foams. 3 figs, 8 tables, 5 refs. (Author)

85. Lubas J [*Inst Gornictwa Naft i Gazownictwa, Poland*]
SPONTANEOUS IGNITION AS A CAUSE OF FIRES IN THE PETROLEUM INDUSTRY
Nafta (Poland); 32(6):205-209, 1976 (Polish; English and Russian Summaries)

Recurrent fires in petroleum plants have led to an investigation of the fire causes. The theory of spontaneous ignition is discussed with particular attention to the spontaneous ignition of the pyrophoric substances FeS and Fe_2S_2 (ferrous sulfide and iron sulfide), which has been found to be one of the main causes of fires in the petroleum industry. The spontaneous ignition temperatures of a number of solid, liquid and gaseous combustibles are given in a table. 1 fig, 2 tables, 4 refs.

86. Hirano T and Tazawa K
EFFECT OF THICKNESS ON DOWNWARD FLAME SPREAD OVER PAPER
Nihon Kasai Gakkai Ronbunshu; 26(1):7-13, 1976 (Japanese; English Summary)

The results of complex laboratory experiments aimed at determining the influence of the thickness of ignited samples of paper on the rate and other characteristics of flame front propagation over a sheet of paper are given. The test methods are described in detail, as are the design and operating principle of the test stands and the monitoring and measuring apparatus. Sheets of paper of four different thicknesses were studied. Graphic data are presented as derived from the results of sensing temperature fields on the surface of the burning paper and in the air zone of heat transfer, as are topographic charts of flame spread in various stages, indicating that the rate of flame front propagation decreases with increasing paper thickness. At the same time, the propagation characteristics of gaseous combustion products, in particular the rate of advance of the front of the gas being generated, and also the rate of advance of the temperature fields in the gaseous medium, are essentially independent of the paper thickness. An explanation and theoretical analysis of the experimentally determined phenomena are given. 10 figs, 10 refs. (RZh)

87. Anon
PLASTICS AND FIRE
Norsk Plast; 9(9):12-14, 1976 (Norwegian)

The results of research being carried out in Norway on the combustibility, smoke-generating capacity and the evolution of toxic gases for several plastics materials are recounted in brief. The combustibility is expressed in terms of the oxygen index. Considerable attention is devoted to the role of combustion and smoke inhibitors added to plastics. 3 figs. (RZh)

88. Matsukawa W, Sueyoshi M and Kogata I
STUDY OF HEAT DISTRIBUTION AROUND A FIRE. PART 2
Fire Sci Lab Japan. Rep; (13):39-45, 1976 (Japanese)

Described in this article are the methods and results of laboratory studies aimed at determining temperature fields in the area of combustible specimens of the following materials: wood, different kinds of paper, cotton and wool fabrics, synthetic resins, gasoline, kerosine, and others. The design and operating principle of the laboratory test stand and the different monitoring and measuring devices used in the studies are described. The design of the test stand makes it possible to obtain distinct comparative information on the particular features and differences of combustion of specimens of the same material, but of different configuration. The results of the investigation are given in graphic and table form. Also determined in addition to the temperature fields were some factors connected with the generation of smoke and the liberation of gaseous toxic combustion products by the test materials. 16 figs, 4 tables. (RZh)

89. Hobart SR and Mack CH [*Southern Regional Res Cent, New Orleans, LA*]
INTERACTION OF FLAME-RETARDANT AND UNTREATED COTTON FABRICS DURING BURNING
Text Res J; 47(5):351-360, 1977

Transfer of flame retardancy from fabric treated with THPOH-NH_3 to untreated cotton fabric during burning was observed on fabric samples sewed together with glass thread. The transfer effect was evidenced by the development of substantial char and the presence of phosphorus and nitrogen in the char of the untreated fabric. Oxygen-index determinations on multilayered combinations of flame-retarded (FR) and untreated fabrics also supported this observation. The extent of FR transfer varied with the geometrical configuration of the layers and the FR add-on. Tests showed that smoke from combustion of THPOH-NH_3-treated fabric, passed through untreated cotton fabric, was the means of transfer of phosphorus, nitrogen, and flame retardancy. The FR transfer effect was also demonstrated for several other phosphorus-containing flame retardancy treatments. 7 figs, 11 tables, 21 refs. (Author)

90. Becker WE, Jr [*Mobay Chem Corp, Pittsburgh, PA*]
POLYURETHANES AND COMBUSTIBILITY
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 92-100
Sponsor: Fire Retardant Chemicals Assoc

A broad overall view is given of the problem of combustibility faced by the cellular plastics industry and channels of information through which more information can be obtained are identified. Urethane foam is considered in particular, but these considerations would also pertain to other cellular plastics, including polystyrene, polyvinyl chloride, etc. Industry guidelines are presented, and the objectives of the Products Research Committee to coordinate and manage the scientific research program on combustibility of cellular plastics burning characteristics for a period of five years are outlined. The key points of the 1976 model code changes for plastic foams are listed, model code "diversified testing" is discussed, and the growing question of toxicity is examined. It is concluded that the cellular plastics industry products must be evaluated in comparison to traditional materials.

91. Miller B [*Text Res Inst, Princeton, NJ*]
A NEW CONCEPT FOR MONITORING THE BURNING BEHAVIOR OF FABRICS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 198-208
Sponsor: Information Council on Fabric Flammability

The use of a convection calorimeter to monitor the heat emission of burning fabrics is a practical, sensitive method for evaluating the burning behavior of such materials. The data can be used to rank fabrics in terms of their potential harm once they ignite. The best way to handle the primary data produced by this technique has not been established; however, the two alternatives presented here seem to be reasonable possibilities. 7 figs, 3 tables, 3 refs. (Author)

92. Finkel M and Block I [*Univ Maryland (College Park) College Human Ecol, Dept Textiles and Consumer Economics*]
HEAT TRANSFER FROM LAYERED SYSTEMS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 255-261
Sponsor: Information Council on Fabric Flammability

Most of the current work on the flammability of apparel fabrics is centered on the measurement of the burning behavior of single fabric layers. However, garments generally consist of multi-layered assemblies, and the performance of the system may not be readily predicted from a knowledge of the characteristics of its components. The performance of layered assemblies has been investigated by other workers on mannequins and in bench scale tests. Often, however, the test devices and procedures were unique to the investigation, so that the results were not always unequivocal. The recent widespread dissemination of the Mushroom Apparel Flammability Tester (MAFT) permits the testing of fabrics in a standard, reproducible format. This report concerns an investigation of the burning behavior of double layer systems tested on the MAFT. 4 tables. (Author)

93. Galil F [*Monsanto Textiles Co, Decatur, AL*]
FLAMMABILITY OF FABRICS FROM MODACRYLIC/ACRYLIC FIBER BLENDS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 185-197
Sponsor: Information Council on Fabric Flammability

It is possible to prepare fabrics with varying "degree" of flammability by blending modacrylic and acrylic fibers and to quantify this degree of flammability by measuring its "Desirability Value." In addition, oxygen index and char length (FF 5-74) were shown to relate to degree of flammability of a specific set of jersey fabrics made from these fiber blends. A fiber blend containing more than 50% modacrylic has sufficiently improved flammability characteristics to qualify as safer fabric in single jersey construction. 6 figs, 9 tables, 5 refs. (Author)

94. Anon
CATEGORIZATION OF MATERIALS AND ELEMENTS OF STRUCTURE ACCORDING TO THEIR REACTION TO FIRE: DEFINITION OF TEST METHODS. Brit Standards Inst, Tech Help to Exporters, Hemel Hempstead, UK; ISBN-0-903886-45-6, 25 pages, Jan 1973
Availability: NTIS BTHE-030 848

This document contains an English translation of the French Arretes of 5 January 1959 and 4 June 1973. Included are the following topics: reaction to fire; fire resistance; alcohol flame tests; radiation tests; categorization of fabrics and of thin pliable sheets; categorization of pliable materials thicker than 0.5 cm and of rigid materials; tests to verify that no flame propagation occurs in electric cables clad with fusible materials; fire-resistant materials; duration of categorization validity; and preparation of categorization reports.

b. COMBUSTION, EXPLOSION, AND FLAMMABILITY TESTS AND METHODS

95. Roberson ES [*Stanton Redcroft, London, UK*]
NEW METHOD OF TESTING THE FLAMMABILITY OF MATERIALS
Aust Plast Rubber; 27(2):13, 16, 1976

A new modification extends the capability of the original flammability test apparatus by enabling critical oxygen indexes to be measured on solids and fabrics at temperatures almost high enough for spontaneous ignition to occur. Introduction of the temperature index concept, defined as the temperature of a material at which its critical index is 20.8, increases the scope of the oxygen index principle and allows information to be obtained on the behavior of materials in circumstances similar to those in a fire. Experimental results show that while most fireproofing additives are effective in making materials virtually inocuous at the primary or ignition stage of a fire, many of them vaporize or break down in later stages (when temperatures begin to rise), and so fail in their task. 4 figs, 1 photo. (Author)

96. Nielsen A
THE COMBUSTIBILITY OF CHRISTMAS TREES
Brandvaern; 2(12):14-15, 1976 (Danish)

In the fall of 1975 the Danish Academy of Technical Sciences carried out a number of tests to determine the combustibility of Christmas trees. Some of the trees had been cut quite recently and were still fresh; others had been cut some time ago and were therefore drier, but they were all set in water-filled stands. Several photographs show how the trees caught fire and then went up in flames, and three graphs show the development and course of the fire. The results are compared in a table. 4 figs, 1 table. (Fachdok 13/0752)

97. Hognon B [*Centre Sci Tech Batim, Service Feu, France*]
ASSESSMENT OF THE IGNITION HAZARD OF MATERIALS BY THE LIMITING OXYGEN INDEX AND THE TEMPERATURE INDEX METHODS
Cah Cent Sci Tech Batim; 172(1393):21-24, 1976 (French)

This critical study was made within the framework of evaluation of the potential contribution of new test methods to regulatory measures in the area of fire safety. Two methods of assessing the ignition hazard of materials are considered: the limiting oxygen index and the temperature index. The second, modified method (with preheating) makes it possible to determine the temperature required for the ignition in air of specimens exposed to a small flame. It seems to be a good test method for manufacturers to choose ignition retardants. The information which the method yields, although less rudimentary than that furnished by the limiting oxygen index method, does not permit prediction and characterization of the behavior of materials in the developing phase of a fire, since the temperature index is not necessarily linked to the ignitability of the material under fire conditions. 2 figs.

98. Fernandez-Pello A and Williams FA [*Univ Calif (La Jolla), Dept Appl Mech and Eng Sci*]
EXPERIMENTAL TECHNIQUES IN THE STUDY OF LAMINAR FLAME SPREAD OVER SOLID COMBUSTIBLE
Combust Sci Technol; 14(4, 5, 6):155-167, 1976

Discussions are given of a variety of experimental methods that have been found useful for studying the mechanisms by which laminar flames spread over combustible solid materials. These include motion-picture and still photography, thermocouple measurement of gas-phase and solid-phase temperatures, interferometric temperature measurements, radiometer measurements, gas sampling and analysis by gas chromotography, particle-track photography and pulsed-wire velocity measurements. The paper contains some new and previously unpublished results obtained by these techniques. 19 figs, 16 refs. (Author)

99. Jankowski and Wisnik T [*Zaklad Linii Elektroenergetycznych, Poland*]
POSSIBILITIES OF IGNITION OF COAL DUST DEPOSITS BY ACCIDENTAL FIRE SOURCES
Energetyka (Poland); 30(9):336-338, 1976 (Polish)

Incidents of cable installation fires in domestic (Polish) electrical power plants show that these fires were caused primarily by ignition of particulates, especially coal dust, which accumulated on cables laid in some areas of the power plant. The temperature of the air surrounding some cable installations (particularly in the boiler region) can exceed 30°C under normal operating conditions. In view of these findings, it was found to be expedient to examine the conditions under which ignition of coal dust deposits (mineral coal, lignite, and others) on cables occur and to determine the effects of combustion of such deposits, especially on PVC cables. 3 tables, 3 refs. (Author)

100. Bellet H
AMMUNITION IGNITION TESTS
Face au Risque; (128):51-53, 1976 (French)

After an ammunition factory had fallen victim to a major fire, a number of tests were conducted to determine the ignitibility of ammunition under various conditions. The aim and purpose of the tests, definitions of the individual parts of ammunition that are fire sensitive and combustible, and the location and arrangement of the tests, which were carried out in a closed 120 m³ room, are described. The points where the ammunition was piled, the sprinklers and detectors were installed, and the TV cameras were located are shown in a figure. Two tests were conducted. Conclusions are drawn regarding optimal fire safety and the fire protection of ammunition. 3 figs. (Fachdok 13/0729)

101. D'Souza MV and McGuire JH [*National Research Council of Canada (Ottawa), Div Build Res, Fire Res Section*]
ASTM E-84 AND THE FLAMMABILITY OF FOAMED THERMOSETTING PLASTICS
Fire Technol; 13(2):85-94, 1977

The tunnel test should be regarded as the base on which the flammability of foamed plastics can be assessed, provided the flame spread ratings are suitably calculated.

If the propagation distance on a bare, thermosetting foamed plastic is small during a tunnel test, then corner wall testing is desirable. The result is then expressed in terms of tunnel rating using a correlation previously derived. For foil-covered thermosetting foamed plastics, a different correlation relates the tunnel and corner wall results. In terms of a merit sequence, the tunnel attributes greater hazard to foil-covered foamed plastics than does the corner wall test. 4 figs, 2 tables, 4 refs. (NFPA)

102. Knoepfler NB, Gentry WT and Madacsi JP [*US Dept Agriculture, Southern Regional Res Center, New Orleans, LA*]
RESISTANCE OF MATTRESSES CONTAINING BORIC ACID TREATED COTTON BATTING TO OPEN FLAME IGNITION
J Consumer Prod Flammability; 4(2):169-187, 1977

Incendiary mattress fires are becoming commonplace in prisons and institutions and are of great concern to the management of such facilities. The Mattress Flammability Standard FF 4-72, while implying that mattresses should resist flaming combustion, requires only that they resist ignition by cigarettes. Mattresses made of polyurethane foam or topped with polyurethane foam over cotton batting are not ignited by cigarettes, therefore comply with the standard. Mattresses containing cotton batting treated with boric acid also comply with the standard. Research was conducted to determine what happens when mattresses that resist ignition by cigarettes are subjected to open flame sources of ignition. Tests showed that polyurethane mattresses can easily be ignited by wooden or paper book matches, and once ignited burn vigorously until completely consumed. The combination foam-cotton mattresses also ignite easily and continue to smolder after the flaming combustion associated with the foam has died down. Cotton mattresses containing boric acid-treated batting do not ignite from wooden or paper book matches under any of the conditions evaluated. The data show that mattresses fabricated from the treated batting are safer and present less hazard than those containing polyurethane foam. 6 figs, 5 tables, 25 refs. (Author)

103. Affens WA, Carhart HW and McLaren GW [*Nav Res Lab, Washington, DC*]
DETERMINATION OF FLAMMABILITY INDEX OF HYDROCARBON FUELS BY MEANS OF A HYDROGEN FLAME IONIZATION DETECTOR
J Fire Flammability; 8(2):141-151, 1977

The response of a hydrogen flame ionization detector (FID) has been shown to be proportional to the flammability index of hydrocarbon-air mixtures. A commercial FID instrument was modified to test this concept. Experimental flammability index data for pure hydrocarbons and their multicomponent mixtures were found to be in good agreement with calculated data. Results were much more accurate than data obtained by a conventional combustible gas indicator. 1 fig, 5 tables, 21 refs. (Author)

104. Hilado CJ, Barnes GJ [*Univ San Francisco, CA, Fire Safety Center*], Kourtides DA and Parker JA
THE USE OF THE HIGH FLUX HEATER IN THE SMOKE CHAMBER TO MEASURE IGNITABILITY AND SMOKE EVOLUTION OF COMPOSITE PANELS
J Fire Flammability; 8(3):324-331, 1977

Ten samples of composite panels were evaluated in the smoke chamber using a high flux heater to produce heat flux levels up to 9.5 W/cm^2. This study demonstrated the potential of this apparatus as a means of evaluating ignitability, as well as smoke evolution. Depending on the material and the heat flux level, ignitability results ranged from ignition within 2 seconds to no ignition during the test period. Smoke density generally increased with increasing heat flux. A composite panel consisting of bismaleimide-fiberglass/bismaleimide honeycomb with carbon microballoons exhibited the lowest smoke density at high heat flux levels and the greatest resistance to autoignition. 1 fig, 3 tables, 9 refs. (Author)

105. Morford RH [*Toyad Corp, Latrobe, PA*]
THE FLAMMABILITY OF NEOPRENE CUSHIONING FOAM
J Fire Flammability; 8(3):279-299, 1977

Neoprene, or polychloroprene, a synthetic rubber, is an organic polymer composed of carbon, hydrogen, and chlorine in the ratio of about 55 to 5 to 40. The relatively high chlorine content of the polymer was responsible for the early recognized resistance of the polymer to burning. Practical use of this property was not developed until procedures for making foam structures from neoprene latex were developed in the 1940's. The US Navy adopted the material to make neoprene foam mattresses that reduced the fire hazards in the crews' quarters of warships. The Navy developed testing procedures and specifications. For more than 25 years, neoprene foam has been the only material that meets Navy specifications. Reviewed in this article are the chemistry, technology, toxicology and testing that had led to the conclusion that neoprene foam provides outstanding resistance to burning and is a superior cushioning material for seating and mattresses in those areas where population density is high and/or vandalism and arson are a problem. The use areas should include rapid transit systems, large public assembly areas, and various governmental institutions. 3 figs, 6 photos, 7 tables, 12 refs. (Author)

106. Muhlenkamp SP and Welker JR [*Univ Oklahoma (Norman), Flame Dynamics Lab*]
THE PYROLYSIS ENERGY OF NATURAL FUELS
J Fire Flammability; 8(2):225-234, 1977

The thermal effects of the pyrolysis of natural fuels were studied using a differential scanning calorimeter (DSC). Having obtained experimental results, a mathematical model is used to model the energy of pyrolysis. The model is based on the energies of pyrolysis of the two primary constituents of plant samples, cellulose and lignin. Thermogravimetric and DSC analyses of freeze-dried plant samples were performed to include the effects of higher concentrations of ether extractives that exist in living plants. 7 refs. (Author)

107. Griggs DI
FLAMMABILITY TEST METHODS: A BACKGROUND PAPER
Text Inst Ind; 14(9):272-273, 1976

The background of British Standards Institute Committee discussion of the new test methods for the flammability of fabrics and fabric assemblies when subjected to a small igniting flame (application of a controlled butane flame to a fabric specimen held vertically around the edges by pins on a frame) is presented. The testing sequence of three tests and their relationship are reproduced in a flow chart. The need for speedy action on performance specifications based on the new methods is discussed. 1 fig, 2 refs.

108. Stamm G [*EMPA, St Gallen, Switzerland*]
PRESENT STATUS OF COMBUSTIBILITY AND FLAMMABILITY TESTING
Textilveredlung; 12(8):341-349, 1977 (German; English Summary)

In the 4th communication of this series (the preceding update was published in *Textilveredlung*, 10(5):201-206, 1975) recent developments in the techniques of flammability testing on textiles and the establishment of standard test methods, performance requirements and new laws are compiled and commented, based on a selection of the literature published between January 1975 and May 1977. The present status of laws for flammability of textiles in additional countries, such as Ireland, Italy, Sweden and South Africa, has been included in this study, as well as the progress made in the appropriate ISO Committee and the European Standard Committee CEN. 1 table, 41 refs. (Author)

109. Morehart JL [*Dept Health, Education and Welfare, Off Safety Manage, Washington, DC*]
FLAMMABILITY OF FLOOR COVERINGS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 67-80
Sponsor: Fire Retardant Chemicals Assoc

Flammability testing of floor coverings, particularly carpeting, on the ceiling of the test chamber as used in ASTM E-84 (Steiner Tunnel) often presents results that are unrealistic. Testing with a separate underlayment has never been successfully accomplished in the Steiner Tunnel. The test method, DOC FF-1-70 (Pill Test), eliminates hazardous carpeting and provides adequate control on flammability except in relatively confined areas, such as corridors, where larger amounts of heat can radiate to the surface of the carpeting to pre-heat it and increase the flame propagation. The recently developed Flooring Radiant Panel Test provides a method to control flammability of floor coverings when used in corridors by determining the critical radiant flux level of the flooring material. Specification of a minimum flux level of 0.5 watts per square centimeter effectively equates to limiting flame propagation to a distance of ten feet down a corridor from the room of fire origin. (Author)

110. Durbetaki P [*Georgia Inst Technol (Atlanta), School Mech Eng, Fire Hazard and Combust Res Lab*]
FUNDAMENTAL STUDIES ON FABRIC IGNITION
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 243-254
Sponsor: Information Council on Fabric Flammability

The ignition process is the first event of the physicochemical processes that lead to accidental destruction by fire. The description of the preignition processes and particularly the prediction of the ignition time are essential not only for explaining fundamental physical and chemical mechanisms, but also for the rational assessment of fire hazards. Experimental and analytical research is being carried out in the Fire Hazard and Combustion Research Laboratory of the School of Mechanical Engineering at Georgia Institute of Technology to measure and predict fabric ignition time as a function of material properties and heating intensities. The ignition studies include single fabrics exposed to radiative and convective (gas flame) heating. This presentation includes: a) a discussion of the ignition process; b) a presentation of two ignition models used for the description of the preignition processes and the prediction of ignition times, together with appropriate ignition criteria; c) a summary of ignition time measurements conducted on fabrics; and d) some results of measured fabric ignition times and a comparison of these with predicted ignition times using one of the analytical models. 6 figs, 4 tables, 10 refs. (Author)

111. Corrie JG
COMPARISON OF AVGAS, N-HEPTANE AND N-HEXANE AS FUEL FOR 0.25 m^2 AREA LABORATORY TEST FIRES FOR FOAM. Fire Res Sta, Borehamwood, UK; Fire Res Note 1067, 5 pages, 3 figs, 1 table, Apr 1977

AVGAS, n-heptane and n-hexane were compared as fuels for the 0.25 m^2 test fires, using three different types of foam liquid, viz, protein, fluoroprotein, and fluorochemical foam concentrates. As a result of the tests, it is recommended that AVGAS be retained as the reference fuel for Defence Standard tests of foam liquids. (Author)

112. Bricker R
AIRCRAFT SEAT CUSHION MATERIALS TESTS. Nat Aeron and Space Admin, LB Johnson Space Center, Houston, TX; NASA TM-X-74632, JSC-09929, 25 pages, Oct 1975
Availability: NTIS N77-21203/3GA

Five component level flammability tests were conducted in a 400 cubic foot chamber to determine the products of combustion and relative destruction of coated (with fire-retardants) and uncoated polyurethane foams during exposure of the foams to a large flaming ignition source for five minutes. The test results indicate that the improved state-of-the-art polyurethane foams without the added fire retardant and coating treatments were not significantly better than untreated older less fire-resistant polyurethane foams. However, by treating and coating the state-of-the-art foams, the production of toxic gases was delayed and the destruction of the foam limited. (Author)

113. Zawistowski EA, Krasny JF, Braun E, Peacock R and Williams N
THE MEASUREMENT OF FABRIC FLAMMABILITY PARAMETERS IN EXPERIMENTS SIMULATING HUMAN MOVEMENT IN BURN ACCIDENTS. Nat Bureau Standards, Inst Appl Technol, Center for Fire Res; NBSIR 77-1236, 25 pages, 7 figs, 11 refs
Availability: NTIS

This paper describes results of experiments simulating the phenomena occurring during burns of apparel items.

Fabrics were burned near a semicylinder that was covered by 54 heat sensors. The areas that received various heat loads (corresponding to various depth of burn injury in real-life flammable garment accidents) were recorded. In most cases, the semicylinder was moved during the burn, so that the burning fabrics made contact with it, simulating movement by the victim during a garment burn. This caused rapid extinguishment in some but not all fabrics. Results are reported for 40 fabrics varying in fiber content, fabric construction, and weight. (Author)

114. Hoffman HH
AIRCRAFT FIRE SIMULATOR TESTING OF CANDIDATE FIRE BARRIER SYSTEMS. TEST AND EVALUATION REPORT. FEB-SEP 76. Nav Wpns Center, China Lake, CA; NWC TP-5915, 41 pages, Nov 1976
Availability: NTIS AD-A038 601/1GA

The results of a study to evaluate candidate aircraft fire barrier materials to in-flight fires are presented. Four organic materials, two inorganic materials, and three metallics combined with insulators were tested in an in-flight fire simulator. Eight intumescent coatings were evaluated to determine their ability to close barrier gaps in the event of a fire. (Author)

c. FIRE AND EXPLOSION HAZARDS OF MATERIALS

115. Taubkin SI and Taubkin IS
FIRE AND EXPLOSION HAZARD OF PARTICULATE MATERIALS AND THEIR MANUFACTURING PROCESSES [Pozharo- i Vzryvoopasnost Pylevidnykh Materialov i Tekhnologicheskikh Protsessov ikh Pererabotki]
Chemistry Publishing House, Moscow; 264 pages, 1976 (Russian)

The scattered information that exists on the fire and explosion hazard of particulate materials in the suspended (aerosol) and precipitated (aerogel) states and on the most important manufacturing processes in which they are used in the chemical industry is synthesized. Data are presented on methods of investigating the fire hazard of dusts, and they are classified by their explosion hazard. The principles of fire and explosion protection of manufacturing processes are examined. The text consists of five chapters, as follows: 1) Dust and its Physical properties; 2) Combustion of Solid Substances and Factors Affecting this Process; 3) Methods of Assessing the Fire- and Explosion-Hazard properties of Dusts and their Classification; 4) Fire and Explosion Hazard of Manufacturing Processes Using Particulate Materials; and 5) Prevention of Dust Ignition and Explosion (Principles). A bibliography of 264 references is included. The book is intended for factory engineers and technicians, personnel of research and design organizations, and for members of the fire service and inspection agencies.

116. Anon
PETROLEUM, LUBRICANTS AND SOLIDS WITH A LOW FLASH POINT: AN UNDERRATED FIRE RISK
Antincend Protez Civ; 28(5):348-352, 1976 (Italian)

The consideration of heavy petroleum products and hydrocarbon compounds with a high flash point (eg, kerosine, transformer oil, lubricants, etc) as being less fire hazardous than such products with a low flash point (eg, gasoline) can lead to a dangerous delusion. They have approximately the same autoignition temperature (220-300°C) and thermal power (≈11,000 kcal/kg). The statistics indicate that, eg, kerosine has been the source of fire more than twice as often as gasoline. Petroleum products in transit represent a not insignificant fire hazard, because they have low viscosity and heat-up. When heavy petroleum products are used in atomized form, air containing 50 g/m^3 of such products takes on fire- and explosion-hazard properties. A large number of fires has occurred because of leaked brake fluids, which, under high pressure when discharged in an accident, form jets of up to 6-10 m. Quenching oils also represent a well-known fire hazard. Vegetable and animal fats, despite their high ignition temperature, have the capability of oxidizing and generating heat, heating up at a high rate and then igniting. Combustible materials that are heavy at ordinary temperature, such as bitumen, rubber, sugar, and sulphur, have specific fire-hazard properties. Sulphur can be in the form of chunks or powder. A powdery cloud of sulphur ignites at a temperature of 190°C. Not a great amount of energy (15 mJ) is required to ignite it. Also presented is a description of the largest fires in plants in the UK where these combustible materials were being used. 5 figs, 3 tables. (RZh)

117. Anon
ASSESSING FIRE HAZARDS — SOME RESEARCH NEEDS
ASTM Standardization News; 5(9):11-13, 1977

This paper is an abbreviated version of a progress report of the ASTM Task Group on Fire Research Needs of the Research Subcommittee of Committee E-39 on Fire Hazard Standards. The Task Group was formed in 1974 to develop a meaningful scheme for integrating fire research information for fire hazard analysis and to pinpoint gaps in knowledge. To facilitate discussion and provide direction, the objective was restated as four tasks, the first of which is considered in this document, namely, identification of methods for quantitatively measuring the fire performance properties of a material, product, or system and using these later in assessing the contribution to the fire hazard of a situation.

118. Hognon B [*Centre Sci Tech Batiment, France*]
POTENTIAL CONTRIBUTION OF THE MAIN SYNTHETIC INSULATING MATERIALS TO INCREASING HAZARDS IN CASE OF FIRE
Cah Cent Sci Tech Batim; 172(1392):1-15, 1976 (French)

The aim of this study is to determine the contribution of the four types of cellular plastics presently used for thermal insulation (expanded polystyrene, polyurethane and polyisocyanurate foams, rigid cellular PVC, and phenolic foams) to the hazards of fire in the initial phase as a function of the air thermolysis and combustion. The study is carried out in three parts: fire behavior tests of rigid cellular plastics; comparative study of the thermal degradation of rigid cellular plastic materials; and pyrolysis and combustion products of rigid cellular plastics. 8 figs, 8 tables, 26 refs.

3. BEHAVIOR AND PROPERTIES OF MATERIALS

c. Fire and Explosion Hazards of Materials—Continued

119. Dubois J
FIRE HAZARDS OF REINFORCED CONCRETE
Chantiers; (76):63-67, 1976 (French)

Some aspects of the fire resistance of concrete and reinforced concrete structures in civil engineering construction projects are examined. Structures are classified by degree of fire resistance and criteria are given for determining the category of structures. 10 figs.

120. Anon
OIL FIRES IN TURBINE INSTALLATIONS AND SIMILAR INDUSTRIAL EQUIPMENT
Face au Risque; (129):37-40, 1977 (French)

Many motors are started up by oil injection accompanied by heat evolution. The fire hazards resulting from such starting mechanisms are dealt with in this article. The design properties of these turbines, the initial (400°C) and vaporization (700°C) temperatures, the oil feed lines and inlet nozzles, the electrical circuits, and the risks that result from this type of device are described. The risks are identified as: heated oil under pressure, danger of leakage, fracture, detonation, and explosion of the exhaust gases. The effects of these fires are discussed, and preventive and precautionary measures to limit such fires, although unfortunately they can never be completely prevented, are described. 3 figs. (Fachdok 13/0682)

121. Anon
RUST HAZARDS IN CARGO TANKERS
Fire Eng J; 37(106):29-30, 1977

Following two minor explosions in vessels discharging crude oil in Thailand, a study was made at the Thornton Research Centre, Shell Research Ltd, UK, on the generation of pyrophoric material in the cargo tanks of crude oil tankers. It was determined that rust of a type found in the ullage regions of cargo tanks can react with hydrogen sulphide at ambient temperatures to form a material that, on exposure to air, undergoes spontaneous pyrophoric oxidation and can accordingly act as a source of ignition in circumstances where the incandescent material comes in contact with combustible vapors.

122. Kerr FL
GRAIN DUST EXPLOSION HAZARDS IN SILOS AND ELEVATORS
Fire Prot Rev; 40(437):27, 1977

Attention is drawn to the explosion hazard of grain dust in silos and elevators, a relatively neglected hazard in Australia and New Zealand, but more common in North America. The combustion mechanism of these dusts, the hazardous conditions under which ignition can occur, and the two-stage process of dust explosion in air are described.

123. Stannard JH, Jr [*Stannard and Co*]
THERMAL RADIATION HAZARDS ASSOCIATED WITH MARINE LNG SPILLS
Fire Technol; 13(1):35-41, 1977

In the breaching of LNG cargo tanks during a ship collision, the hazard would result primarily from thermal radiation, since ignition would be instantaneous, minimizing the hazard from vapor cloud drift of unignited flammable vapor. The US Coast Guard rules and regulations regarding construction of LNG tank ships require ability to withstand groundings and collisions without loss of cargo. The combination of port operational controls and construction standards appears to provide adequate hazard avoidance for both people and structures. 2 figs, 12 refs. (NFPA)

124. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
THE POSSIBILITY OF FLASH FIRES IN TOXICITY TESTS
J Combust Toxicol; 4(2):206-215, 1977

The concentrations of combustible compounds in the gases generated in toxicity tests may together result in a flammable mixture which could be ignited by accident or by a deficiency in procedure. The principal hazard stems from the increase in the concentrations of combustible non-toxic gases that may result from efforts to increase the concentrations of toxic gases to obtain desired physiological responses. 7 tables, 9 refs. (Author)

125. Cusick GE [*UMIST, UK*]
TEXTILES AND FLAMMABILITY
Text Month; (8):22-23, 25, Aug, 1977

The subject of flammability has steadily occupied the concern of the textile industry in recent years, accelerated by the increasing legislative implications based on stringent standards of testing and performance. The degree of interest in the subject was underlined recently by a two-day international conference in Manchester, UK, which drew 200 people to hear ten papers on the theme "Flammability of Textiles." The ten papers in the conference dealt with the most significant aspects of flammability of textiles, as follows: 1) Chemical and Physical Aspects of Textile Flammability; 2) Ignition of Polymeric Material; 3) Methods for Quantitative Monitoring of Burning Behavior; 4) New BSI (British Standards Institute) Test Methods and ISO (International Standardization Organization) Work; 5) Legislative Implications of the New BSI Test Methods; 6) Flame Retardant Fibres; 7) ZIRPRO Finish for Wool; 8) Chemical Finishes with Special Reference to Pyrovatex CP; 9) Fire Hazards in Furnishings; and 10) Thermally Resistant Fabrics for Protective Clothing. Each of the ten papers is summarized briefly in this article.

126. Fink P [*EMPA, St. Gallen, Switzerland*]
FIRE AND TEXTILES
Textilveredlung; 12(8):319-320, 1977 (German; English Summary)

Textile fires and their consequences are reviewed. Varying relations between numerous factors determine the burning process. The textile and the chemical industries have developed processes and agents providing significant protection against textile fires. Protective finishes must, however, be supplemented by preventive measures. Legislation becomes necessary only if a critical limit is exceeded. (Author)

127. Stamm G [*EMPA, St. Gallen, Switzerland*]
FIRE: PROTECTION OR ENDANGERMENT BY TEXTILES
Textilveredlung; 12(8):320-326, 1977 (German; English Summary)

The first part of this paper – general information on the topic – outlines the present state of knowledge on the influence of heat flux on human skin, risks caused by combustion gases, on reactions taking place when textiles burn, and on possibilities for diminishing their flammability. At the end of the first part, test methods and standard requirements presently in force in Switzerland are listed. In the second part the burning behavior of various textiles, of apparel, of textiles for bedding and draperies and of carpets is reviewed. Considerations to be kept in mind when drawing up new legal requirements are pointed out. 1 fig, 8 tables, 7 refs. (Author)

128. Smelkov GI, Aleksandrov AA, Poedintsev IF and Tsygan RM
METHOD OF DETERMINING THE FIRE HAZARD OF ELECTRICAL WIRING IN A PIPE
USSR Patent No. 491,906; Cl G01R 31/12, H02G 3/00, Appl 24 Oct 1972, Discl. 5 Apr 1976, Assignee: VNII Protivopozhar Oborony

The method consists in placing electrical wires in a pipe and studying the behavior of the material when exposed to internal heating under live loads. In order to increase the accuracy of the tests and to reduce the time required to carry them out, a four-fold current load is passed through the wires, as compared to the nominal load of each conductor, until visible signs of a fire hazard appear, eg, smoke; the voltage drop is determined, as is the level of the fire hazard, from the total loss in weight and the loss in electrical power expended in heating the wires, as calculated by a formula.

d. NATURE OF COMBUSTION PRODUCTS

129. Anon
SMOKE AND OTHER PRODUCTS OF COMBUSTION
NFPA, Boston, MA; 100 pages, 1976

Eleven articles on smoke and other products of combustion from *Fire Journal* and *Fire Technology* have been gathered together in this book. Included are detailed reports of actual fires and fire tests.

130. Tsuchiya Y and Sumi K [*Nat Res Council Canada, Div Build Res, Fire Res Sect, Ottawa, Canada*]
THERMAL DECOMPOSITION PRODUCTS OF POLYACRYLONITRILE
J Appl Polym Sci; 21(4):975-980, 1977

The decomposition products of a polyacrylonitrile yarn thermally decomposed at temperatures of 400°, 600°, and 800°C, under a flow of either air or nitrogen, have been analyzed by gas chromatography and gas-chromatographic mass spectroanalysis. Hydrogen cyanide and 16 other nitriles were identified and quantified. Decomposition products contained a series of aliphatic nitriles of various chain lengths, and HCN was the predominant toxic product. 4 tables, 13 refs. (Author)

131. Lerner NR [*Nat Aeron and Space Admin, Ames Res Center, Moffett Field, CA*]
THERMOCHEMICAL CHARACTERIZATION OF POLYMERS FOR IMPROVED FIRE SAFETY
J Combust Toxicol; 4(2):181-192, 1977

Apparatus has been constructed for studying the thermal decomposition of polymers as a function of temperature. Such data is needed to evaluate the toxic threat presented by polymeric materials under fire conditions such as the smoldering fire of the type that occurs in closed areas such as coat closets, in which anaerobic decomposition of polymers occurs. The apparatus allows the products of thermal decomposition to be collected and analyzed by infrared spectrometry and mass spectrometry. Data obtained from dog hair, an aromatic polyamide, polyphenylene sulfide, and polybenzimidazole are presented. It was found that significant amounts of toxic gas were evolved from dog hair at temperatures as low as 250°C, while temperatures in excess of 500°C were necessary in order for the evolution of toxic gas from the aromatic polymers to become significant. 8 figs, 1 table, 3 refs. (Author)

132. Benisek L and Phillips WA [*Internat Wool Secretariat, Tech Centre, Ilkley, West Yorkshire, UK*]
THE EFFECT OF pH ON THE SMOKE EMISSION OF WOOL
J Fire Flammability; 8(3):247-254, 1977

The lowest smoke density emission of wool, under the flaming conditions of the NBS Smoke Density Chamber, is observed in the isoelectric region of wool, pH 4-6, where the fiber is most crosslinked and stable. High and low pH values of wool significantly increase smoke particulate emission, particularly the rate of smoke production. Acids that impart flame-resistance to wool, such as phosphoric, sulphuric and sulphamic, significantly increase the rate of smoke particulate emission under flaming conditions. Weak acids, such as formic and acetic, affect smoke emission of wool less than hydrochloric, which is a stronger acid. Treatment of wool with nitric acid affects smoke emission less than other strong acids, under both flaming and smoldering conditions, probably due to modification of the fibre. Under smoldering conditions the effect of pH on the smoke emission of wool is less significant. 2 figs, 1 table, 31 refs. (Author)

133. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
STUDIES WITH THE ARAPAHOE SMOKE CHAMBER
J Fire Flammability; 8(3):300-308, 1977

Samples of polymethyl methacrylate, polyvinyl chloride, polyester, and polystyrene were evaluated using the Arapahoe smoke chamber. These same materials had been previously evaluated using the NBS smoke chamber. The percent smoke based on initial weight as determined using the Arapahoe smoke chamber appeared to correlate with the maximum specific optical density under flaming conditions as determined using the NBS smoke chamber. This empirical correlation appears justifiable because of similarity of exposure and basis of calculation. The percent smoke based on weight loss as determined using the Arapahoe smoke chamber appeared to correlate with the maximum specific optical density under nonflaming conditions as determined using the NBS smoke chamber. This correlation is empirical and the authors can offer no logical explanation for it. The Arapahoe smoke chamber offers the advantage of high sample throughput and the possibility of related studies of smoke particulates. 3 figs, 2 tables, 5 refs. (Author)

3. BEHAVIOR AND PROPERTIES OF MATERIALS

d. Nature of Combustion Products—Continued

134. Spurgeon JC, Speitel LC and Feher RE [*Fed Aviat Admin, Nat Aviat Facilities Experim Center, Atlantic City, NJ*]
OXIDATIVE PYROLYSIS OF AIRCRAFT INTERIOR MATERIALS
J Fire Flammability; 8(3):349-363, 1977

Thirteen aircraft interior materials were thermally decomposed using a combustion tube furnace. The thermal degradation products were analyzed for HCN, H_2S, HCl, and HCHO by polarography; NO_2 and SO_2 by spectrophotometry; HF by potentiometry; and CO by NDIR (Nondispersive Infrared Analysis). Parametric studies were conducted to characterize the effects of oxygen availability, airflow rate, and temperature on gas yields. These materials were also tested under flaming conditions in the NBS smoke chamber, and the same 8 gases were measured using identical analytical procedures. The gas yields obtained by the two test methods have been compared by calculating the coefficients of correlation. 10 figs, 6 tables, 11 refs. (Author)

135. Morikawa T
EVOLUTION OF ACROLEIN AND FORMALDEHYDE IN SMOULDERING COMBUSTION
Nihon Kasai Gakkai Ronbunshu; 26(1):1-5, 1976 (Japanese; English Summary)

The process of formation of toxic products (acrolein and formaldehyde) during smoldering combustion of organic materials containing only carbon, hydrogen and oxygen, in particular synthetic and natural polymers, such as polyethylene, polypropylene, polyethylene phthalate, polymethyl methacrylate, polystyrene, phenol resin, cellulose, wood, gauze and cotton, is studied. It was found that the maximum concentration of acrolein reached 0.5-3.5 mol/g of material at the optimal temperature (temperature at which the maximum quantity of acrolein is released) in the order of increase in concentration for the following series: polypropylene, vinelon, and cellulose. The content of formaldehyde reached about 1/10 of the content of acrolein, but considering that the toxicity of acrolein exceeds that of formaldehyde by a factor of greater than 20, acrolein can be considered as the main toxic product in the combustion of the above-listed materials. It is shown that the combustion oxygen for materials not containing oxygen is drawn from the atmosphere, but for cellulosic materials the combustion process is sustained by oxygen in the material. During the combustion of cellulosic materials the content of acrolein and formaldehyde in the combustion products is 1/2 to 1/3 the quantity of those same substances generated during the combustion of the other materials, the concentration of toxic products (in the case of cellulose) not exceeding the safe permissible limit. (RZh)

136. Spurgeon JC, Speitel LC and Feher RE
THERMAL DECOMPOSITION PRODUCTS OF AIRCRAFT INTERIOR MATERIALS. Nat Aviat Facilities Experim Center, Atlantic City, NJ; FAA NA-76-53, FAA Rd-77/20, 55 pages, 21 figs, 6 tables, 26 refs, Apr 1977
Availability: NTIS; AD-A039 511/1GA

Seventy-five typical aircraft interior materials were thermally decomposed using a combustion tube furnace. A 250-milligram sample was exposed to a temperature of 600°C for 5 minutes while maintaining an airflow rate of 2 liters per minute through the combustion tube. The combustion products were collected in liquid-filled fritted bubblers, and the contents were analyzed for hydrogen cyanide, hydrogen sulfide, hydrogen chloride, hydrogen bromide, and formaldehyde by differential pulse polarography; nitrogen dioxide and sulfur dioxide by visible spectrophotometry; and hydrogen fluoride by potentiometric titration. Carbon monoxide was collected in plastic sample bags and measured by nondispersive infrared analysis. The yields of the nine gases have been reported in terms of milligrams per gram of material. Parametric studies were also conducted to characterize the effects of experimental parameters on gas yields. These parameters include sample weight (250 and 750 mg), percent oxygen (0, 10.5 and 23%), airflow rate (1 to 3 lpm), and temperature (400, 600, and 800°C). (Author)

e. PROTECTION AND MODIFICATION OF MATERIALS

137. James RL and Shawhan GJ [*Stauffer Chem Co, Westport, CT, Specialty Chem Div*]
FIRE RESISTANT LUBRICANT FOR GAS TURBINES
Diesel Gas Turb Progr; 42(4):28-29, 1976

The properties of Fyrquel G7, a non-toxic fire-resistant gas turbine lubricant for high-temperature industrial use, are described. The criteria followed in developing Fyrquel were: fire resistance for improved operational safety; thermal, oxidative, and hydrolytic stability to increase lubricant reliability with the result of improved turbine availability; low coking propensity that will create reduced maintenance costs; and environmental compatibility as the result of a non-toxic fluid that possesses ease of reclamation. 3 figs, 4 tables.

138. Behnke WP [*EI du Pont de Nemours and Co, Textile Fibers Dept*]
THERMAL PROTECTIVE PERFORMANCE TEST FOR CLOTHING
Fire Technol; 13(1):6-12, 1977

A test method developed to evaluate materials for protective clothing measures heat transfer received by the wearer. The fabric is exposed to an energy source, and the heat transmitted through the fabric is measured on a calorimeter until the response exceeds the level known to cause second degree burns. Time of exposure required to exceed the tolerance level is multiplied by the heat flux of exposure to give the TPP (Thermal Protective Performance) rating of the specimen. TPP ratings reported ranged from 16.8 cal cm^{-2} for rubber-coated cotton to 67 cal cm^{-2} for aluminized Nomex. 3 figs, 2 tables, 2 refs. (NFPA)

139. Kawaller SI [*Carboline Co*]
UPDATE ON MAGNESIUM OXYCHLORIDE FIREPROOFING
Fire Technol; 13(2):139-145, 1977

A 1/2-in. thick coating of a new formulation of magnesium oxychloride, hard enough to stand mechanical abuse, provided fire protection for structural steel equivalent to 2 in. of concrete. It also met OSHA regulations limiting the use of asbestos in sprayed-on fireproofing. Exposure to aging, weather, or ultraviolet-rich environments did not result in a significant loss of fire resistant characteristics in the new formulation. Magnesium oxychloride was mildly corrosive to unprimed structural steel, but not to steel having an alkyd primer and topcoated with a chlorinated rubber sealer. For extremely humid conditions, an inorganic zinc primer should be considered. 4 tables, 6 refs. (NFPA)

140. Jarusek J [*Vysoka Skola Chemickotechnologicka, Pardubice, Czechoslovakia*]
FIRE PROTECTION USING COATINGS
Koroze Ochr Mater; 20(2):36-38, 1976 (Czech)

The principles of fire-protection coatings and their production are reviewed, followed by a brief discussion of the coatings being produced in Czechoslovakia, such as Synpreg, AS, CF, Betogen D-55, and Pyroton. Tests have been made of the fire-protective qualities of foreign and Czech coatings and impregnating agents by the methods given in Czech standard CSN 73 0853. It was found that the foreign foam agents exhibited excellent fire-protective qualities, which could not be matched by the domestic products. 1 table.

141. Hoff A
CHEMICAL PRINCIPLES OF REDUCTION OF FLAMMABILITY AND SMOKE RELEASE
Plastforum; 7(9):3031, 3033, 1976 (Swedish)

The role of flame retardants being added to polymers to reduce their combustibility and their operating mechanisms, classified in three categories, are considered. The first category of retardants accelerates decomposition in the melted polymer layer at the flame front, converting this layer into an incombustible material which prevents flame movement over the surface. The second category enters into reaction with the combustible gases generated during the pyrolysis of polymers, forming new incombustible compounds. The third category forms products that mix with the hot gases and reduce their combustibility. By their interaction with the polymers to which they are added the retardants are also classified in 3 categories: additives which do not react with polymers; reactive retardants that form new groups in the structure of the polymer molecule; and synergistic retardants that take on fire-resistant properties only after reacting with certain components of the polymers. Examples of the retardants and their effectiveness are given, as are examples of additives that reduce smoke formation, the main ones being aluminum hydrate and molybdenum and antimony oxide. 6 tables. (RZh)

142. Vold M [*Pyrotectors Inc, Drammen, Norway*]
FIREPROOF COATINGS ON STEEL STRUCTURES
Schiff Hafen; 28(Special Issue):391-393, 1976 (English)

The principles of applying fireproof coatings to steel, the methods and materials used, and recent advances in the technique are reviewed, especially as they apply to tankers and offshore oilrigs. 10 figs.

143. Blum A and Ames BN [*Univ Calif* (*Berkeley*)]
FLAME-RETARDANT ADDITIVES AS POSSIBLE CANCER HAZARDS
Science; 195(4273):17-23, 1977

Until recently, little attention was paid to the long-term biological effects of flame-retardant compounds. The main organic chemicals used in flame retardants contain bromine or chlorine or they are phosphate eaters. Some have chemical structures that are closely related to compounds known to cause cancer or to be toxic to animals. Several compounds previously used as flame retardants have been shown to be teratogenic (causing monstrosity), carcinogenic, mutagenic, or highly toxic. Discussed in this article are the implications of the finding that tris-(2,3-dibromopropyl) phosphate (tris-BP), the main flame retardant currently used in children's pajamas, is a mutagen. 2 figs, 1 table, 53 refs.

144. Heiz H [*Internationales Wollsekretariat, Zuerich, Switzerland*]
WOOL: PROTECTION AGAINST FIRE AND HEAT
Textilveredlung; 12(8):336-341, 1977 (German; English Summary)

Wool is a naturally flame-resistant fiber. International Wool Secretariat flame-resistant treatments increase the flame resistance of wool, so that very high requirements of flame resistance are met. In combination with easy-care processes, very suitable fabrics for protective clothing can be produced with pure new wool or wool-rich blends. 6 figs, 4 refs. (Author)

145. Loss R [*Gruppe fuer Ruestungsdienste, Bern, Switzerland*]
CONSIDERATIONS ON THE STATE OF THE ART OF FLAME-RESISTANT CLOTHING
Textilveredlung; 12(8):333-335, 1977 (German; English Summary)

Flammability ratings and flammability criteria are explained and areas where textiles are used are reviewed. The present state of methods achieving flame retardancy is outlined and, with the combat uniform serving as example, the author shows that many parameters have to be considered in the evaluation of such an article, which rules out simple general solutions. Four targets for the textile industry are proposed. 3 tables, 4 refs. (Author)

146. Ramohalli K [*Calif Inst Technol* (*Pasadena*), *Jet Prop Lab, Control and Energy Conversion Div*]
A CONCEPT OF IMPROVED FIRE SAFETY THROUGH COATED FILLERS; Paper No. 77-16
Combustion Inst, Western States Sect, Spring Meeting; 1977, Apr 17-18, Seattle, WA
Sponsor: Combustion Inst

A new concept for improved fire-safety is presented. Theoretical concepts behind, and experimental results from, current tests are described. The concept involves slightly modifying the state-of-the-art filled polymers used extensively as construction materials. (Fiberglass reinforced resins are typical examples and are used in applications varying from boat construction to aircraft interiors.) The concept involves COATING THE FILLER with a small amount (1% – 5% of total material weight) of a chemical before use in the resin. The coat properties are carefully selected such that the thermal contact between the resin and the filler is good until the ignition temperature of the overall material is reached. The thermal contact is required to deteriorate drastically after the ignition point. The overall thermal conductivity/diffusivity of the construction material is thus tailored to be very good before ignition and to be poor after ignition. The concept is diagramatically illustrated in the paper. The high thermal conductivity before ignition should result in a low burn rate and low evolution rates of volatiles. This concept of IMPROVED FIRE-SAFETY THROUGH COATED FILLERS is tested on several samples in the standard NBS smoke-density chamber at JPL. Some of the results have been very encouraging. The discussion covers some of the practical problems encountered and methods of alleviation in implementing this concept. 34 pages, 11 figs, 1 table, 13 refs. (Author)

147. Anderson JM [*Albi Mfg Corp, Ellington, CT*]
FIREPROOFING COATINGS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 110-125
Sponsor: Fire Retardant Chemicals Assoc

The potential threat to life and property posed by burning buildings has been of concern for many years. There is a growing awareness within the fire-retardants industry of the need for improved technology in the area of fire causes, fire safety, fire prevention, firefighting, and fire loss prevention. It is within the area of fire loss prevention that fireproofing coatings and thermal fire barriers make their most significant contribution. Discussed in this light are the criteria for material selection and specification, the role of the specifier, regulatory influences, anticipated exposure conditions, surface preparation, material thickness and density, application and finish, and thermal fire barriers.

148. Clark ES, Jr [*ES Clark Associates, Inc, Jacksonville, FL*]
INTUMESCENT COATINGS FOR FURNITURE, WALLS, KITCHENS, ETC
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 101-109
Sponsor: Fire Retardant Chemicals Assoc

Following a review of what happens in a fire, covering flashover, flame spread, radiation and convection, the characteristics of fire-retardant coatings, particularly intumescents, their testing, ratings, encoding, and cracking properties, are explained. The effects and results of using fire-retardant coatings instead of conventional combustible coatings, such as gas generation, inhibition of flame spread, and substrate insulation, are examined. Considerations in selecting and using fire-retardant coatings are presented.

149. Fritz TW [*Armstrong Cork Co, Res and Dev Center, Lancaster, PA*]
ACHIEVING THE REQUIRED FIRE PERFORMANCE FOR FLOOR COVERINGS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 144-158
Sponsor: Fire Retardant Chemicals Assoc

The major requirements and agencies regulating floor coverings are listed in a table; the test methods, ASTM E-84 tunnel, UL-992 floor chamber, the pill test, the NBS smoke-density and flooring radiant panel tests, are described. The use of fire retardants in resilient floor coverings (vinyls) and carpeting to meet the fire-performance requirements is discussed. The ideal fire retardant for use in either a carpet or a resilient floor covering should be expected to be one that can be incorporated simply into the floor-covering system, that is permanent, that provides consistent reproducible results, and that does not reveal the presence of the retardant and does not cause a change in the appearance, feel, soiling rate, or static performance of the finished product. 1 table.

150. Hipchen DE [*Jim Walter Res Corp*]
FIRE PERFORMANCE OF CELLULAR PLASTIC INSULATIONS, COMPETITIVE INSULATIONS, AND OTHER INTERIOR LINING MATERIALS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 159-163
Sponsor: Fire Retardant Chemicals Assoc

Large-scale fire tests such as 25-ft-high and 8-ft-high corner flammability tests and full-scale building fire tests, are discussed. Motion pictures of 19 such fire tests on several cellular plastic insulations, competitive insulations and other interior lining materials in building construction are shown. The results of this test program indicate that commercial cellular plastic insulations can show equal or better fire performance in buildings than other insulations and interior lining materials. It is also evident that the need for thermal barriers on cellular plastic insulations is not absolute. Further, the fire performance of insulated buildings is not solely determined by the fire performance of the individual materials of construction but can be significantly affected by how these materials are assembled in a building. (Author)

151. McNeil RR [*Weyerhaeuser Co, Fire Technol Sect, Longview, WA*]
IMPROVING FIRE PROPERTIES OF WOOD
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 127-143
Sponsor: Fire Retardant Chemicals Assoc

In order to put in perspective the fire-retardant needs for wood and wood products, the fire properties of wood, namely, flame spread, rate of heat release, toxicity of combustion products, smoke, penetration endurance, and ease of ignition, as they apply to the product categories of structural members, interior finish, sheathing and underlayment, exterior siding and roofing, doors and windows, flooring, trim, cabinets and furniture, are examined. Problem areas in fire-retardant processing of wood and wood products are identified as being economic, undesirable physical properties, process limitations, and toxicity of treating chemicals. Fire-retardant chemical producers are urged to work closely with wood product producers to develop treatments specifically for wood. 1 table.

152. Stavrakas EJ
FLAME RESISTANCE IN PERSPECTIVE
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 333-337
Sponsor: Information Council on Fabric Flammability

The objective to be achieved in flame resistance is not, at this time, the prevention of all fabric-related burn injuries, but to attack the major problem first. The evidence obtained by apparel and textile flammability testing of many 100% nylon and 100% polyester garments conducted by the JC Penney Company on mannekins suggests that these fabrics are clearly lower-risk garments. The data indicate that the severity of the burn cases connected with the 100% synthetic (thermoplastic) fabrics is less than that associated with fabrics containing cellulosics. But this finding cannot be announced to the general public and cannot be applied to a specific garment offered for use until a nationally recognized test method has been developed which adequately measures the burn risk potential of individual fabrics. 1 table

153. Bruce JP [*Stauffer Chem Co, Specialty Chem Div, Textile Chemicals, Westport, CT*]
NEW DEVELOPMENTS IN FIRE-RETARDANT CHEMICALS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 284-289
Sponsor: Information Council on Fabric Flammability

The flame-retardant chemicals that are now or soon will be commercially available for consideration by the textile mills for the topical treatment of their products are described. Among these chemicals are THPX, TH-urea precondensates, phosphonates, combination products for natural, synthetic and blended fibers, and a number of emulsions and brominated materials for 100% polyesters and nylon.

154. Daniher FA [*Michigan Chem Corp, Ann Arbor, MI*]
STUDIES ON THE BIOAVAILABILITY OF TRIS-(2,3-DIBROMOPROPYL) PHOSPHATE FROM TREATED TEXTILES
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 319-332
Sponsor: Information Council on Fabric Flammability

Analysis of the scientific evidence relating to the use of tris-(2,3-dibromopropyl) phosphate (TBPP) in textiles leads to the following conclusions: 1) no data exist to support the claim that TBPP is absorbed through the skin from a treated fabric; 2) TBPP may be ingested in small amounts by infant mouthing habits. The dose level of TBPP resulting in no mutagenic effect in animal studies is more than 1,100 times the maximum amount which could be ingested by a child from a typical treated fabric prior to home laundering. Although presently there is some indication that TBPP and/or its metabolites possess mutagenic activity under specific test conditions, there are no known results to indicate that TBPP presents a mutagenic hazard as used in flame-retardant fabrics. 9 slides, 3 tables.

155. Harris RH [*Environ Defense Fund, Tris Chemicals Program, Washington, DC*]
POTENTIAL HEALTH HAZARDS OF THE FLAME RETARDANT CHEMICAL TRIS-(2,3-DIBROMOPROPYL) PHOSPHATE
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 307-318
Sponsor: Information Council on Fabric Flammability

The conclusions of this contribution indicate that the use of tris-(2,3-dibromopropyl) phosphate results in exposure to high levels of tris at the surface of the garment which can be easily ingested by mouthing the fabric or absorbed through the skin by dermal contact. Mutagenicity studies on both prokaryotic and eukaryotic cells, coupled with evidence that one of the contaminants of tris is a potent carcinogen, imply that the use of tris in flame-retarding sleepwear may represent a substantial cancer hazard to users, workers, and those exposed through environmental contamination. Although the precise mutagenic and carcinogenic risk to the public is unknown, the large numbers of individuals exposed to this chemical should warrant immediate action to reduce or eliminate this exposure. 3 figs, 1 table, 19 refs.

156. Lipowitz J, Swihart TJ, Ziemelis MJ and Kalinowski RE [*Dow Corning Corp, Midland, MI*]
SILICONES AS FINISHES FOR FLAME RETARDANT FABRICS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 228-242
Sponsor: Information Council on Fabric Flammability

Silicones have enjoyed widespread use in the textile industry both as processing aids and as textile finishes. The use of silicones as softeners and as lubricants for flame-retarded fabrics would be especially desirable because these fabrics tend to be stiff and harsh. However, some cases of increased flammability resulting from the use of certain silicones have been reported. This paper reviews the effect of silicones on flammability of various types of textiles and shows where flammability problems occur and why the problems exist. A new type of silicone finish is described which does not increase the flammability of textile materials on which silicones have caused flammability problems in the past. 10 figs, 6 tables, 8 refs. (Author)

157. Martin JR and Miller B [*Text Res Inst, Princeton, NJ*]
EFFECTS OF LAUNDERING ON FLAME RETARDANCE
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 221-227
Sponsor: Information Council on Fabric Flammability

According to the results obtained thus far, loss of flame retardance on laundering appears to involve a decrease in the sensitivity of burning rate to oxygen concentration caused by hard water salts. That such a decrease is observed for both untreated and flame-retardant fabrics is an indication that hard water salts act, at least in certain instances, on the textile polymer rather than on the flame-retardant additive. Furthermore, since oxygen sensitivity loss occurs when fabric is treated with solutions containing calcium and carbonate ions and not when $CaCO_3$ is applied directly, ionic interaction with the polymer may be involved. Such interaction may occur instead of or in addition to deposition of $CaCO_3$ formed *in situ*, presumably on the fiber surfaces. One conceivable hypothesis to explain loss of oxygen sensitivity is that the rate of burning might be controlled not by the rate of reaction with oxygen (as long as a concentration sufficient for combustion is present), but by the rate of fuel production, that is, the rate of diffusion of polymer decomposition products through the salt-modified fiber surface. 3 figs, 4 refs. (Author)

158. Pelz A and Jilek F
FIRE-RETARDANT COATING SYSTEM
Austrian Patent No. 330,320; Cl 22 D 001/05, (C09D 005/18), Appl 29 Mar 1974, Discl. 25 Jun 1976, Assignee: Chemie AG, Linz, Austria

The patent disclosure relates to corrosion-resistant, antiseptic, incombustible paint coatings for painting metal and wood components. Intumescent graphite is used as the fire-retarding component. The binder consists of at least two components, a halogen-containing elastomer and a synthetic resin. The thickness of the intumescent layer increases by a factor of 10-14 when heated. Examples are presented of paint coatings with an endurance of 90-100 min at 500°C. 14 claims, no drawing figs. (RZh)

159. Guilhaumou J-M and Reumont P
FLAME-SPREAD-RESISTANT ELECTRICAL CABLE AND ITS FABRICATION METHOD
French Patent No. 2,278,139; Cl H01B 7/22, Appl 9 Jul 1974, Discl. 6 Feb 1976, Assignee: Thomson-Brandt, France

This invention relates to an electric cable resistant to flame propagation and a fabrication method. The cable consists of one or several current-conducting cores insulated with polyethylene or plasticized polyvinylchloride encased in a non-flammable metal sheath preventing flame propagation. The purpose of the sheath is to spread the fire gases and the local heating over the cable so as to cool it to a temperature that would prevent decomposition of the organic components of the cable and flame spread along the cable. Standard fire tests in a radiation furnace showed that exposure of the cable in the furnace for ten minutes did not lead to the generation of smoke or flame. After removing the cable from the furnace it was found that the metal sheath and other cable components were not altered. After this test the metal sheath was removed and the cable was exposed to the same furnace test, from which it was found that the cable ignited in several minutes and flame spread over the length of the cable, leading to destruction of the cable. No drawing figs. (RZh)

160. Retif CF and Chevanne SVL
THERMALLY INSULATING AND FIRE-RESISTANT MATERIAL
French Patent No. 2,274,580; Cl C04B 43/00, B32B 19/02, Appl 13 Jun 1974, Discl. 9 Jan 1976, Assignee: Authors

A patent is disclosed for an incombustible heat-insulating material and a method of fabrication. The material is a laminated structure with a cellular core for thermal insulation and with heat-reflecting, transparent, protective layers to lend mechanical strength. The core consists of 0.1-10 mm particles obtained by mechanical fractionation of porous coal (or phenolic rubber) and of organic rubber, polyurethane, polysterene, etc. The reflecting layers are made of a material based on lime, magnesium, silicon and/or aluminum and of an aqueous solution of sodium or potash. The core thickness is 4 mm to 5 cm, that of the reflector 2-4 mm. The material is reinforced with metal wire or a metal mesh. The fabrication method is proposed, as follows: the first reflecting layer is prepared, the reinforcing mesh is applied to it, a fractionated cellular mass is put on, and a layer of reflecting material is poured on the top. Drying is at normal temperature or at a temperature of +50°C. No drawing figs. (RZh)

161. Cottrell AG
SURFACE TREATMENT OF PARTICULATE SOLIDS
US Patent No. 3,963,627; Cl 252/4, (A62D 1/12), Appl 11 Jun 1974, Discl. 15 Jun 1976, Priority: UK, Appl No 7385/70, 16 Feb 1970, Assignee: Imperial Chem Industries Ltd, London, England

The patent relates to a fire-fighting, foam-compatible powder containing a fire-extinguishing powder and from 0.1% to 5% of a partially hydrophobic powdered silica, having a surface area of at least 20 square meters per gram, and carrying a surface treatment with a silane, wherein the degree of hydrophobicity measured by the methanol titration test is in the range of 3 to 35. 2 claims, no drawing figs. (Author)

162. Haley G, Silverman B and Tajima Y
DEVELOPMENT OF FIRE RESISTANT, NONTOXIC AIRCRAFT INTERIOR MATERIALS. TECHNICAL REPORT, 21 JUN 1975-30 SEP 1976. Lockheed-Calif Co, Burbank, CA; NASA CR-137920, 91 pages, Sep 1976
Availability: NTIS N77-14205/7GA

All available newly developed nonmetallic polymers were examined for possible usage in developing fire resistant, nontoxic nonmetallic parts or assemblies for aircraft interiors. Specifically, feasibility for the development of clear films for new decorative laminates, compression moldings, injection molded parts, thermoformed plastic parts, and flexible foams were given primary considerations. Preliminary data on the flame resistant characteristics of the materials were obtained. Preliminary toxicity data were generated from samples for materials submitted from the contractor. (Author)

163. Parts L and Thompson CA
FLAME- AND SMOKE-RETARDANT POLYMER SYSTEMS. QUARTERLY REPORT NO. 2, AUG-OCT 1976. Monsanto Res Corp, Dayton Lab, Dayton, OH; Quart Rep No. 2, 61 pages, Apr 1977
Availability: NTIS AD-A039 367/8GA

Experimental smoke-retardant PVC compositions and a reference base polymer were coated with alkyd- and epoxy-based intumescent paints. Specimens were tested in an NBS smoke density chamber under flame and nonflame exposure conditions. The smoke optical density and the concentrations of CO, CO_2, NO_x, hydrocarbons, hydrogen chloride and oxygen were monitored during these tests. Although the coatings reduced smoke formation from the base polymer, they had an adverse effect on the performance of the smoke-retardant compositions. The commercial coatings used in this work were found to generate significant quantities of smoke. Other, recently developed coatings will be used in projected work. The intumescent coatings reduced the rates of carbon monoxide and hydrogen chloride formation, especially under nonflame exposure to a radiant energy source. The coatings contributed small amounts of nitrogen oxides to the combustion products. (See also AD-A039 915/4GA for Report No. 3.) (Author)

164. Parts L, Myers RD and May NF
FLAME- AND SMOKE-RETARDANT POLYMER SYSTEMS. QUARTERLY REPORT NO. 3, NOV 76-JAN 77. Monsanto Res Corp, Dayton Lab, Dayton, OH; Quart Rep No. 3, 36 pages, May 1977
Availability: NTIS AD-A039 915/4GA

Experimental neoprene rubber compositions were prepared to investigate the feasibility of reducing smoke formation and improving other fire performance characteristics with incorporated additives. Specimens were tested in an NBS smoke density chamber under flame and nonflame exposure conditions. The smoke optical density and the concentrations of CO, CO_2, NO_x, hydrocarbons, hydrogen chloride and hydrogen cyanide were monitored during these tests. Ferric acetylacetonate by itself and in combination with poly(ammonium phosphate) reduced smoke optical density generated from neoprene foam under flame exposure conditions by approximately 10%. Cupric acetylacetonate, another candidate char formation catalyst evaluated in this work, catalyzed thermal degradation of the neoprene foam. Ferric acetylacetonate catalyzed the formation of CO under nonflame exposure conditions. This catalytic effect was destroyed by incorporating poly(ammonium phosphate) with ferric acetylacetonate. Crosslinking catalysts more effective than those used in the presently reported work are needed to reduce smoke formation from neoprene foam significantly. (See also AD-A039 367/8GA for Report No. 2.) (Author)

165. Toy MS
DEVELOPMENT OF FLAME RESISTANT TREATMENT FOR NOMEX FIBROUS STRUCTURES. INTERIM TECHNICAL REPORT, 3 NOV 1975-31 MAR 1977. Sci Applications, Inc, LaJolla, CA; NASA CR-151247, SAI-76-546-SV, 25 pages, Mar 1977
Availability: NTIS N77-21236/3GA

Flame-resistant fibrous materials for space shuttle application were developed through chemical modification of commercially available aromatic polyamide fibrous products. The new surface treatment was achieved in the laboratory by ultraviolet activation of the fabric in the presence of fluoroolefin monomers and a diluent gas. The monomers grafted under these conditions provide the improved properties of the fabric in flame resistance, chemical inertness, and nonwettability without the sacrifice of color or physical properties. The laboratory reaction vessel was scaled-up to a batch continuous process, which treats ten yards of the commercial width textiles. The treated commercial-width Nomex (HT-10-41) from the scaled-up reactor is self-extinguishing in an oxygen-enriched environment, water-repellent, soft, silky, and improved in chemical resistance. Unlike most textile processes, the grafting unit operates under dry conditions and no chemical by-products have to be washed out of the finished product. (Author)

166. Hadvig S [*Tech Univ Denmark, Lyngby, Denmark*]
THE TEMPERATURES IN STEEL PROFILES PROTECTED BY INTUMESCENT COATING SYSTEMS AND EXPOSED TO PLASTIC FIRES
Flammability and Fire Retardants Symp, Internat, Proc; 1976, May 6-7, Toronto, Canada, pages 166-178

Experience has shown that unprotected steel constructions have low resistance during fire, as the steel very quickly loses its bearing capacity. To counteract this, the individual parts of the steel construction can be thermally insulated, but this involves, of course, an increase in the outer dimensions of the construction. The use of intumescent coatings for fire protection of structural steel, as long as the paint is effective, can be an excellent solution to the problem. A characteristic of this type of paint is that, with increasing temperature, a number of chemical processes take place and the layers of paint become many times thicker. A heat insulating effect is thus achieved. The aim of this study is to attempt to provide answers to the following two questions: 1) can an intumescent coating swell up quickly enough in a fire spreading as rapidly as one caused by plastics? and 2) is an intumescent coating effective in the atmosphere of combustion products from burning plastics? A further aim of the study is to provide, from numerous measurements, data that can be used in connection with both intumescent coating and plastic combustion. 14 figs, 2 tables, 7 refs. (Author)

f. STABILITY OF MATERIALS AT ELEVATED TEMPERATURES

167. Anon
THE FIRE BEHAVIOR OF WOOD
ASELF; (57):33, 37, 39, 43, 45, 1976 (Spanish)

Wooden structures and wooden components are often considered to be the cause of fire spread in occupancies and buildings because of erroneous ideas as to the high flammability of wood. It has been found, however, that wooden structures have a definite fire stability because of the capability of wood to form a fire-resistant layer of charcoal on its surface when exposed to high temperatures. It is well known that water evaporates from wood at a temperature of 100°C, that thermal decomposition of the wood occurs at 200°C, and that wood chars between 260 and 290°C. The thermal conductivity of charred wood is one order of magnitude lower than that of the wood itself (0.02 kcal/m, hr, °C compared to 0.13), thus increasing its fire stability considerably.

168. Anderberg Y and Thelandersson S
STRESS AND DEFORMATION CHARACTERISTICS OF CONCRETE AT HIGH TEMPERATURES. PART 2. EXPERIMENTAL INVESTIGATION AND MATERIAL BEHAVIOR MODEL. Lund Inst Technol, Div Struct Mech and Concr Constr, Lund, Sweden; Lund Bull 54, 84 pages, 49 figs, 5 tables, 17 refs, Aug 1976 (English)

This paper is the second and final report of a research project carried out at Lund Institute of Technology, Division of Structural Mechanics and Concrete Construction, Sweden, sponsored by the Swedish Council of Building Research. The first report, "Stress and Deformation Characteristics of Concrete at High Temperatures. Part

1. General Discussion and Critical Review of Literature," was published in 1973 as Bull 34 of the Lund Institute of Technology. The aim of the research is to provide the theoretical and experimental basis for an analysis of stresses and deformations of concrete subjected to high temperatures. This second and final part contains the experimental investigation and a model of the material behavior of concrete under transient high-temperature conditions. The principal result is that the mechanical behavior of loaded concrete under these conditions is considerably different from that observed under steady-state conditions. The compressive strains induced by compressive stresses are much greater during heating than at constant temperature. This is valid for the first heating cycle; for subsequent cycles the behavior is different. The general implication of the model is that stresses in concrete upon first heating due to differential or restrained thermal expansion are insignificant or even nonexistent. Such stresses cannot of themselves contribute to compression failure. It is also obvious that an elastic stress distribution bears little resemblance to reality and is virtually meaningless, even as a rough qualitative estimate. The suggested model is especially important for problems such as statically indeterminate concrete structures and slender columns exposed to heat, where an accurate estimate of deformations is necessary. (Author)

169. Anderberg Y

FIRE-EXPOSED HYPERSTATIC CONCRETE STRUCTURES — AN EXPERIMENTAL AND THEORETICAL STUDY. Lund Inst Technol, Div Struct Mech and Concr Constr, Lund, Sweden; Lund Bull 55, 186 pages, 98 figs, 15 tables, 47 refs, Aug 1976 (English)

The present paper is devoted to an experimental investigation of reinforced and prestressed concrete structures exposed to fire with allowance for the influence of representative actual fire processes. The structural behavior is followed up to the rest state after cooling with respect to residual stresses and deformations, residual load-carrying capacity, and flexural stiffness. The study is made for support conditions, for a pure type of hyperstatic structure, and includes a continuous registration of temperature gradients, deformations, cracking formations, and restraint bending moments. The measurements are made entirely during fire exposure under the combined influence of fire and external transverse loads. The experimental part is directly coupled with a comprehensive theoretical analysis, comprising an evaluation of the thermal and structural response of the structure under study. The structural behavior study is based on a computer model modeled and expanded after the model for response analysis of reinforced concrete frames in a fire environment constructed at the University of California at Berkeley by Becker and Bresler (1974). The principal new contribution to the model is the material behavior model of concrete that is valid under transient high-temperature conditions. The new model yields a functionally more correct description of the mechanical behavior of fire-exposed concrete, thus improving prospects for realistic fire-engineering designs not only for the structure studied here, but also for other types of concrete structures. (Author)

170. Anderberg Y

MECHANICAL BEHAVIOUR IN FIRE OF CONCRETE AND HYPERSTATIC CONCRETE STRUCTURES. Lund Inst Technol, Div Struct Mech and Concr Constr, Lund, Sweden; Lund Bull 56, 9 pages, Sep 1976 (English)

This report represents a summary version of two previous publications, "Stress and Deformation Characteristics of Concrete at High Temperatures. Part 2. Experimental Investigation and Material Behavior Model," by Y Anderberg and S. Thelandersun (Lund Bull 54) and "Fire-Exposed Hyperstatic Concrete Structures – An Experimental and Theoretical Study," by Y Anderberg (Lund Bull 55), which was presented at the Douglas McHenry symposium on Concrete and Concrete Structures held in Mexico City in October, 1976, under the title of "A Constitutive Law for Concrete at Transient High-Temperature Conditions" and "Fire-Exposed Hyperstatic Structures – An Experimental and Theoretical Study." (For reviews of the original papers see the two preceding abstracts.)

4. FIRE MODELING AND TESTING

a. FIELD EVALUATION

171. Tsuchiya K, Hara I, Ojura Y and Aihara M

BEHAVIOR OF COMPONENTS OF THE CONTACT WIRE SUSPENSION DURING A TRAIN FIRE IN A TUNNEL

Tetsudo Gijutsu Kenkyu Shiryo; 33(5):178, 1976 (Japanese)

An experiment to determine the behavior of components of the contact wire suspension during a train fire in a tunnel was carried out in the Wanishi tunnel on the island of Hokkaido, Japan, in September, 1975, in which a passenger car was burned. Various components of the contact wire suspension were located above the car. After the fire the components were transferred to the laboratory to measure their characteristics. Particular attention was paid to the conductors and insulators. The temperature inside the car reached 1,170°C. The flame shot out the car windows, and the maximum temperature on the upper side of the tunnel wall reached 800°C. In the center portion of the overhead the temperature was 100-200°C. The maximum temperature of the wire elements of the suspension was 146°C. The wire of the component with a temperature of 800°C decreased in strength by 53-63%. Aluminum conductors melted completely. The maximum temperature of the insulators was 204°C. It is recommended that the overhead be moved to the top center instead of the top side of the tunnel. The contact wire suspension did not drop on the car during the fire. 1 fig. (RZh)

b. FIRE BEHAVIOR

c. FIRE TESTING OF COMPONENTS AND STRUCTURES

172. Gartner F

ASPECTS OF FIRE PROTECTION FOR MULTISTORY BUILDINGS

Aluminium (Duesseldorf); 52(10):601-604, 1976 (German)

The problems of fire protection of aluminum building components, especially facades, are discussed in this article. The aim is to reach optimal guidelines for facade components by correlating and defining the pertinent regulations, particularly with regard to fire protection. To reach this goal, the results of fire tests are described, general fire risks are discussed, and suggestions for the solution of existing problems are made. 8 figs, 1 table. (Author)

173. Bright RG [*Nat Bureau Standards, Center for Fire Res*]
A NEW TEST METHOD FOR AUTOMATIC FIRE DETECTION DEVICES
Fire Technol; 13(2):105-113, 1977

Test methods for automatic fire detection devices in the US use different types and sizes of fires to evaluate different classes of detectors. The result is a lack of comparison test data for each detector class. A new test method is proposed in which all automatic fire detectors, regardless of sensor type, would be subjected to a series of the same test fires. In addition, each test fire series would consist of three different test fire sizes. The results obtained should permit matching a detector's characteristics against a specific fire risk, resulting in a more intelligent application of automatic fire detectors. 2 figs, 11 tables, 4 refs. (NFPA)

174. Duskin FE [*McDonnell Douglas Corp, Long Beach, CA, Douglas Aircraft Co, Interior Des Co*]
FIRE TESTING OF AIRCRAFT CABINS
J Fire Flammability; 8(2):193-201, 1977

McDonnell Douglas Corporation is currently engaged in aircraft fire safety research and development programs. This effort includes full-scale fire testing of configurations representing commercial aircraft interiors. These tests are being conducted in the Douglas Aircraft Company's Cabin Fire Simulator (CFS). The CFS is a double-walled steel cylinder 12 feet in diameter and 40 feet long equipped with a ventilation system, exhaust scrubber, and a nitrogen extinguishing system. An onsite computer is used to record thermal and gas analysis data. Many series of tests have been conducted, one of which culminated in a full cabin lavatory fire test. Subsequent testing of lavatory modules has demonstrated the fire resistance of contemporary materials and the effectiveness of design improvements. 8 figs. (Author)

175. Nelson GL, Bridgman AL [*General Electric Co, Plastics Business Div, Pittsfield, MA*], O'Connell WJJ and Williams JB
MATERIAL PERFORMANCE IN TRANSPORTATION VEHICLE INTERIORS
J Fire Flammability; 8(3):262-278, 1977

The increasing realization that laboratory tests are useful only for comparison of materials and that only large-scale tests can evaluate hazards presented by use of materials in systems in end environments has led the General Electric Plastics Division to engage in extensive large-scale fire testing at its facility in Mount Vernon, Indiana. Over 350 large-scale fire test experiments have been conducted, including room corner tests, window tests, skylight tests, covered workway tests, and vehicle interior mock-up tests. The goal of this work is to study the performance of materials, not only in standard tests, but also in real world environments, and the relationship of criteria as documented in guidelines to real improvements in those environments from a fire-safety standpoint. Described in this paper is the fire test facility and results, rail car assembly mock-ups, and bus interior assembly fire tests, the aim of the system performance tests being to confine fire, if possible, to the area of origin or to delay fire spread for as long as possible. 8 figs, 2 tables, 15 refs.

176. Buergi H
FIGHTING FIRES IN TUNNELS
Schweiz Feuerwehr Z; 103(2):57, 59, 62-65, 67-68, 1977 (German)

In order to investigate the course of tunnel fires a series of tests was carried out with varying quantities of unleaded gasoline. Measured were the time curve of the CO concentrations and of the air temperature along the tunnel, the visibility conditions and the distribution of smoke gases, the effect of ventilation on the course of the fire (longitudinal, oblique, and cross ventilation), the effect of fixed extinguishing systems, the most expedient extinguishing method, exposure of people and vehicles in the tunnel at various distances from the seat of the fire, and the heat load on the tunnel installations near the seat of the fire. In addition to evaluating the individual results, it was also found that the burning of large quantities of fuel in a highway tunnel can have a disastrous outcome for both the user and the tunnel. 1 fig, 4 tables. (Fachdok 13/0484)

177. Anon
FIRE TESTS IN COLD-STORAGE AREAS
Sigurnost; 18(3):101-106, 1976 (Serbocroation)

A description is given of fire tests carried out in Italy in a cold-storage area (70 x 70 x 14 m) with fixed fire detectors and sprinklers. The tests were carried out at temperatures of +150°C to −23°C. The tests showed that the general guidelines for the design of fire protection systems are also applicable for cold-storage areas, but that the air flows, fire loads, and special arrangement of the fire detection and extinguishing systems must be considered. 3 figs, 3 tables. (Fachdok 13/0758)

178. Ahlen B and Odeen K
FIRE PROPERTIES OF "LIGHT" ROOFS
Vaeg- och Vattenbygg; 22(12):36-40, 1976 (Swedish)

Studies made in Sweden on the fire safety of "light roofs," which are made of corrugated steel sheets with thermal insulation and tar paper, are described. The studies were made at the Fire Technology Laboratory of the National Materials Testing Institute. The effect of wind on flame spread, the effectiveness of various construction measures aimed at limiting spread, and the influence of fire and heat in the case of fires moving downwards on roofs made of various insulating and binding materials were investigated. It was found that the most widespread roofs of this type are fire hazardous and are easily damaged in fires. 6 figs. (RZh)

4. FIRE MODELING AND TESTING

c. Fire Testing of Components and Structures—Continued

179. Cianciolo AD [*Factory Mutual Res Corp, Norwood, MA*]
CORNER WALL FIRE PERFORMANCE OF RIGID CELLULAR PLASTICS WALL AND CEILING INSULATION IN LARGE ROOM SPACES
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 1-22
Sponsor: Fire Retardant Chemicals Assoc

The corner wall fire tests conducted by Factory Mutual (FM) for the Society of the Plastics Industry (SPI) are reported. The tests were carried out in the FM corner wall, which is 25 ft high and has walls at right angles of 50 and 40 ft, resp, and is roofed over. The fire source is a 750-lb crib of wood positioned in the corner. The tests were arranged in three parts: 1) metal-faced wall panels; b) exposed spray-on foams; and c) spray-on foams with spray-on coatings. The test samples were commercially available and were selected on the basis of ASTM E-84 flame spread for identification only. Results were expressed as "acceptable" or "failed," acceptable meaning that the material does not produce a self-propagating fire within the limits of the structure as evidenced by flaming or material damage.

180. McQuire JH
SMALL-SCALE FIRE TEST OF 6-INCH WALL PENETRATED BY TELEPHONE CABLES. Nat Res Council Canada, Div Build Res, Ottawa, Canada; BR Note 116, Nov 1976

A positive-pressure fire test was carried out on two small-scale 6 in. thick, high-temperature concrete walls penetrated by 13 multi-core and 6 coaxial telephone cables. Alumina-silica-ceramic bulk fiber, capped at the exterior face with cementitious sealant, constituted the firestopping around the cables. The penetrations proved satisfactory except for those involving the two largest cables, which gave unacceptably high temperatures after approximately 2 hr of test. Sealing the ends of the cables could have further improved performance. (Author)

d. FIRE TESTING OF MATERIALS

181. Maroni WS [*Factory Mutual Res Corp, Norwood, MA*]
TESTING FOR FIRE RETARDANCY
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 23-37
Sponsor: Fire Retardant Chemicals Assoc

Some of the present fire test methods for textiles, paints, wood, plastics and building materials are reviewed, showing that most of the present methods are based on convective heat flux primarily. In actual building fires, however, Factory Mutual research indicates that the radiative heat flux can be far more important than any other factor. Various modes of heat transfer in the Factory Mutual building corner test are demonstrated, as is the new test for fire retardancy in the Factory Mutual mass burning rate apparatus.

182. Parker WJ
AN INVESTIGATION OF THE FIRE ENVIRONMENT IN THE ASTM E84 TUNNEL TEST. Nat Bureau Standards, Inst Appl Technol, Center for Build Technol; NBS TN 945, 65 pages, 49 figs, 6 tables, 14 refs
Availability: GPO

Measurements were made of heat flux, oxygen concentration, temperature, velocity and pressure in a series of instrumented ASTM E 84 tunnel tests using 1) standard length specimens, 2) 0.91-m (3-ft) long specimens, and 3) a reference specimen consisting of asbestos-cement board and an auxiliary controlled supply of methane. Five different flow rates of methane to the auxiliary burner provided constant and known heat inputs simulating the gaseous decomposition products from regular test specimens. Incident heat fluxes on an inert specimen surface as high as 6.3 W/cm^2 (5.5 $Btu/ft^2 \cdot s$) were measured within the flame impingement zone with a water-cooled heat flux meter 0.61 m (2 ft) downstream from the burner. While oxygen depletion in the tunnel did not appear to be a dominating factor in controlling the flame spread, the oxygen depletion measured in the exhaust duct beyond the tunnel correlated with the total rate of heat production of the specimens. It appears that the differences in the observed burning behavior of materials in the tunnel test and in a room may be mainly due to differences in the incident heat flux distribution in the two cases. These distributions reflect the different geometries, orientations, and ignition sources. The potential for rapid flame spread of some low flame spread classification (FSC) low-density materials is evident from observations of the flame propagation along these materials during the tunnel test, but is not adequately reflected in the flame spread classification. (Author)

e. MODELING AND SCALING

183. West H and Brown E [*Univ Engrs Inc, Norman, OK*]
COMPUTER SIMULATION APPLIED TO FIRE SAFETY ANALYSIS
Computer Simulation Conf, Summer, 1976, Proc; 1976, Jul 12-14, Washington, DC, pages 126-130
Sponsor: AICHE, ISA, SHARE, *et al.*

Historically, fire control systems were designed after processing equipment arrangements were firmly defined. Although local, state, and national fire-safety codes influence the design of equipment that must contain hazardous materials, these codes cannot foresee all hazard possibilities in this era of rapidly changing technologies. Hence, the extent of possible consequences of increased process unit size has dictated more extensive use of accident simulation models and has necessitated their utilization at earlier stages in project definition. By designing the hazard control system in response to the perceived accident potential, a higher level of fire safety can be achieved. Because of the inability to test these hazard control systems under actual emergency conditions, simulation is the foundation for fire safety analysis. 4 figs, 14 refs.

184. Alpert RL [*Factory Mutual Res Corp, Norwood, MA*]
PRESSURE MODELING OF TRANSIENT CRIB FIRES
Combust Sci Technol; 15(1, 2):11-20, 1977

It has previously been demonstrated that free burning fires in solid fuels can be modeled by increasing the ambient air pressure while reducing all length scales with the two-thirds power of pressure. The modeling concept has been tested, up till now, for steady or quasi-steady aspects of fires in simple, isolated fuel elements of wood or solid plastic. The current study is concerned with testing the pressure modeling concept for the important transient processes of fire growth and decay in pine-wood cribs ignited at the center of the crib base. In addition, the validity of pressure modeling compartment fires is tested by burning cribs within simplified, vented enclosures. Measurements of crib burning rates for a ten-to-one range of length scale show that pressure modeling of portions of the burning rate time history is indeed feasible. While modeling of ventilation-controlled crib fires is highly successful, it appears that a lack of modeling of the rate of radial fire spread within the crib allows only peak burning rates and the fire decay process to be modeled in the fuel surface-controlled regime. For the specific crib geometries considered, the effect of an enclosure on fire intensity is measurable and can be pressure modeled. 8 figs, 2 tables, 8 refs. (Author)

185. Hilado CJ [*Univ San Francisco, CA, Fire Safety Center*]
THE CORRELATION OF LABORATORY TEST RESULTS WITH BEHAVIOR IN REAL FIRES
J Fire Flammability; 8(2):202-209, 1977

Laboratory tests have been condemned as misleading because they do not always predict behavior in real fires. General condemnation seems unjustified in the light of available data. Many laboratory tests are employed with the purpose of eliminating fire hazard by preventing ignition, and fires that did not happen provide no data for correlation. Correlations are sometimes attempted between a laboratory test that emphasizes one fire response characteristic and a fire situation in which the hazard relates to a different fire response characteristic. Correlations may fail in particular cases, but in general, something less likely to burn or emit undesirable products in a laboratory test is less likely to be a hazard in a real fire. 3 tables, 25 refs. (Author)

186. Tatem PA, Marshall PD and Williams FW [*Nav Res Lab, Washington, DC, Chem Dynamics Branch, Combust Sect*]
CORRELATION OF LARGE AND SMALL SCALE TESTS ON CARBON-IMPREGNATED POLYURETHANE FOAMS
J Fire Flammability; 8(2):180-192, 1977

A program is underway at the Naval Research Laboratory to develop small-scale laboratory fire tests that will predict the behavior of Class A materials in fires more accurately. After the development of five small-scale performance specifications to assess the hazard of carbon-impregnated polyurethane, samples of these materials were installed in a large-scale fire test facility to determine the scaling parameters applicable to the foam. The knowledge gained from the large-scale tests under different experimental conditions and with several polyether and polyester foams has been used to scale down to a laboratory test that can dynamically measure the expected behavior of the foam in a scaled situation. 6 figs, 2 tables, 10 refs. (Author)

187. Charak I and Person LW
SPOOL-FIRE: AN IBM 370/195 CODE FOR THE ANALYSIS OF COMBINED SPRAY AND POOL BURNING OF SODIUM. Argonne Nat Lab; CONF-761001-49, 13 pages, 1976
Availability: NTIS

A code for the computation of the pressure and temperatures within a containment building as a result of a sodium fire is described. The fire is assumed to occur in two distinct phases: a spray and a pool. The spray fire is conservatively assumed to occur instantaneously. The pool fire model used is the SOFIRE-II model developed by Atomics International. The code calculates all important temperatures, accounting for heat loss from the building to the environment, as well as leakage of the containment atmosphere under conditions of internal overpressure. The IBM CSMP methodology is used to solve the set of ordinary differential equations that model the system. The use of CSMP allows the user considerable flexibility in modifying the models employed. (This report was presented at the International Meeting on Fast Reactor Safety and Related Physics, Chicago, IL, Oct, 1976.)

5. FIRE PROTECTION OF STRUCTURES

a. BUILDING DESIGN AND CONSTRUCTION

188. Achilles E
FIRE PROTECTION IN THE TALLEST HIGHRISE BUILDING IN THE FEDERAL REPUBLIC OF GERMANY
Brandschutz; 31(2):48-50, 1977 (German)

The fire-protection requirements for equipping highrise buildings have been raised appreciably in the last few years and have therefore become better adapted to the increased risk and the negative experiences from damage claims. An example is the 162-m tall hotel and office building opposite the Frankfurt (FRG) fairgrounds, for which the construction work began in 1972. Here the latest findings have been applied to an optimal solution of the fire-protection problem. The design and structural details, which are tailored to the dual purpose of the building, are described. All conceivable measures for structural fire protection in conjunction with a modern fire detection and extinguishing system, wet standpipes with wall hydrants, public address system in all rooms, and appropriate training of personnel provide for extensive safety. 2 figs. (Fachdok 13/0510)

189. Polzin L
FIRE PROTECTION IN A HIGHRISE LABORATORY BUILDING IN BERLIN
Brandschutz; 31(2):51-53, 1977 (German)

A building complex serving a very special purpose is described here. It is the Schering AG research center in Berlin, the principal component of which is a highrise laboratory building. The structural description covers the entire complex and pictures the particular work processes in the individual sections. In some cases these sections require special fire-protection measures, which are reported. The complex is also provided with a well-equipped private fire brigade. 4 figs. (Fachdok 13/0534)

5. FIRE PROTECTION OF STRUCTURES

a. Building Design and Construction—Continued

190. Harmathy TZ [*Nat Res Council, Canada*]
DESIGN APPROACH TO FIRE SAFETY IN BUILDINGS
Build Eng; (297):175-178, 1976

The underlying principles of the present building code approach to providing fire safety in buildings are examined critically and the principal features of building fires reviewed. A new design approach is suggested. If followed from the early stages of architectural design, it will result in a higher degree of fire safety and often in considerable savings in building costs. It is shown that fire protection requirements depend strongly on compartment ventilation and that they can sometimes be waived without endangering the fire safety of the building. Some basic design rules are presented to guide the building designer in his preliminary deliberations. (Author)

191. Roach AP [*Dept of Environment, UK, Bldg Regulations, Professional Div*]
DEVELOPMENTS IN TOWN CENTRES
Fire Eng J; 37(105):17-21, 1977

The history of fire legislation in the UK is reviewed, as are developments in building legislation relating to fire protection in recent years, particularly means of escape, and application of the regulations, which is a matter for local authority. The general requirements for sprinklers and non-combustible construction should be supplemented by the requirement of compartmentation, smoke venting and unaided escape routes. Continuing maintenance and management are urged. (This paper, which was presented at the Institution of Fire Engineers 1976 Conference, is followed by a two-page discussion of the paper.)

192. Wakabayashi K
FIRE AND EXPLOSION PREVENTION ENGINEERING
Soda to Enso; 27(7):221-237, 1976 (Japanese)

An analysis is made of the fire safety of an abstract system consisting of a large number of comparatively simple elements. The analysis is made by operations research methods and also by the theory of random Markov processes. To simplify the analysis use is made of methods of determining the reliability of a non-redundant system by the reliability of its components; a direct analogy is also drawn between the concepts of "reliability of a system and its components" and the "fire safety of a system and its components," as well as between the concepts of a "fire system and its components" and the "failure of a system and its components." In a simple non-redundant system the failure of any component is equivalent to failure of the system as a whole, which corresponds to the fact that ignition of one component leads to burning of the system as a whole. Such a system of components is considered as a series system in analogy with a sequence of series-connected conductors in which failure of any one conductor is equivalent to disruption of the entire series. The fire hazard of the entire system is expressed in terms of the fire hazard of the individual components. It is proposed that there exists a certain time interval $(0,\tau)$ during which the fire safety (error-free operation) of the system must be guaranteed. If the fire safety of the system is characterized by some law $P(t)$, it is necessary to know the value of the fire safety for $t=\tau$, that is, $P(\tau)$. This is not a function, but a definite number, and therefore the argument τ can be discarded and the fire safety of the system can be denoted simply by P. The fire safety of the individual components must also be denoted analogously by $P_1, P_2, P_3, \ldots, P_n$. In order to guarantee the fire safety of the system over the period τ, it is necessary that the fire safety of each component be guaranteed. The following notation is introduced: S is an event consisting in the preservation of the fire safety of the system during the period τ; $E_1, E_2, E_3, \ldots, E_n$ are events consisting in the preservation of the fire safety of the individual components. The event S is the product (combination) of the events $E_1, E_2, \ldots, E_n$, that is, $S=E_1$ x E_2 x ... x E_n. It is assumed that the components can catch fire independently of each other. Then, according to the rules of multiplication of probabilities of independent events, $P(S)=P(E_1)$ x $P(E_2)$ x $P(E_3)$... x $P(E_n)$, that is, $P=p_1$ x p_2 x p_3...x p_n, which can be written in the formalized statistical form

$$P=\prod_{i=1}^{n} p_i,$$

that is, fire safety of a simple system made up of independent components is equal to the statistical product of the fire safeties of the individual components of the system. An analysis is made of the possibility of using the theory of branching processes and of the topological methods of graph theory to evaluate the fire safety or more complex systems in which there exist specific regularities in the sequence of ignition of the individual components. (RZh)

b. DETECTION AND ALARM

193. Kersten W
PHOTOELECTRIC FIRE ALARM SYSTEM FOR INTERIOR AREAS
Elek-Prakt; 30(7):240, 1976 (German)

A fire alarm for various power supply facilities has been developed. The device is actuated when smoke appears in the premises being protected and optical and acoustic signals are triggered on the fire-protection panel. The operational status of the device is monitored by variation of the light flux incident on the detector via a light filter. The sensitivity of the device can be regulated by special accessories.

194. Anon
FIRE DETECTION AND ALARM SYSTEMS
Eng Mat Des; 20(8):7-12, 1976

Introduced in this first part of the review article are the gaseous agents presently used for fire extinguishment (CO_2, Halons 1301 and 1211) as the most expedient for fires in buildings containing costly installations and equipment. The choice of agent will influence the choice of the detection systems, which are the prime subject of the article. Described and illustrated are heat detectors, line detectors, heat-sensitive detector bulbs or fusible plug systems, smoke, flame, and explosion detectors. Also discussed are the alarm devices, mostly coincident with the detection, suppression, and control systems, as well as the different methods of calling fire departments. Some of the factors that assist in choosing detection and alarm systems are outlined. 7 figs.

195. Hill MD and Wrixon AD [*Nat Radiol Prot Board, Harwell, UK*]
IONISATION CHAMBER SMOKE DETECTORS
Fire Eng J; 37(106):14-16, 1977

In connection with the growing use of domestic detectors, reports have appeared in the press and elsewhere claiming that ionization chamber smoke detectors (ISCD) containing the most commonly used radionuclide, Americium-241, present an unnecessary hazard to the public. Such statements may cause needless anxiety, particularly amongst members of the public and the fire service. This article attempts to place the risks from these devices in perspective, concluding that the risk to individuals from domestic ICSDs is even smaller than that from industrial types. 3 figs.

196. Bukowski RW [*Nat Bureau of Standards, Center for Fire Res, Washington, DC*]
FIELD INVESTIGATION OF RESIDENTIAL SMOKE DETECTORS
Fire J; 71(2):18, 21-30, 41, 1977

This paper is excerpted from the report "Detector Sensitivity and Siting Requirements for Dwellings" by the author and others, Report No. NBS GCR-75-51. The full report was abstracted in *FTA*, 1(1/2), abstract 243. See also the critique of this report in the next abstract. 25 figs, 3 tables, 1 ref.

197. Gallagher EL [*Fire Equipment Manufacturers' Assoc, Inc, Residential Firesafety Tech Comm*]
FEMA: NBS TESTS DO NOT REFLECT REALITY
Fire J; 71(2):19, 38-41, 1977

Six of the seven conclusions drawn in a National Bureau of Standards (NBS) report on residential smoke detectors (Detector Sensitivity and Siting Requirements for Dwellings, by RW Bukowski *et al*, NBS GCR-75-51, reviewed in *FTA*, 1(1/2), 1976, abstract 243) are regarded as unjustified and unsupported by the test data. Based on an examination of the NBS report, it is suggested by the author, Chairman of the Residential Firesafety Technical Committee of the Fire Equipment Manufacturers' Association (FEMA), that the conclusions were derived from unrealistic test procedures and test conditions that were not representative of actual residential fire conditions. The article disagrees with the NBS conclusions that fixed temperature and rate-of-rise heat detectors in the room of origin provide little life-saving potential. The tenability criterion selected by the NBS was regarded as arbitrary and unrealistic. 5 figs. (NFPA)

198. Solomon EE [*Gamewell/Alarmtronics*]
A NEW CONCEPT IN IONIZATION DETECTOR DESIGN
Fire J; 71(1):51-57, 1977

An ionization chamber for the detection of combustion products which uses a lower energy beta emitter instead of a commonly used high energy alpha emitter is described. The low-energy, short-range beta particles result in greater volumetric efficiency in the detection chamber. Nickel 63, the beta emitter, is a very weak ionization source; thus, sensitivity to smoke particles is greatly enhanced. With the Nickel 63 smoke detector there is a great increase in detection ability and a decrease in potential health hazards compared to the Americium 241 type. 10 figs, 1 table, 9 refs. (NFPA)

199. Thorpe RF [*Falcon Safety Products, Inc*]
A NEW CONCEPT IN HEAT DETECTOR DESIGN
Fire J; 71(2):69-71, 96, 1977

Prompted by competition from smoke detectors, one manufacturer of heat detectors has developed a heat detector that passed the 50-ft UL fire test and can be sold wholesale in the 5 to 7 dollar range. The alarm, a plastic horn powered by 2 ounces of dichlorodifluoromethane, sounded for 10 min (6 min longer than UL requirements). Plates 0.003 in. thick, when coupled with a thin layer of eutectic metal and activated in oven tests at almost the rated temperature of the device, gave a sensor with no thermal lag. The new-design, low-cost heat detector passed all of the UL requirements in terms of activation sensitivity. (NFPA)

200. Anon
STANDARD SMOKE DETECTORS FOR RESIDENTIAL PREMISES
Fire Prot Rev; 40(440):13, 1977

The stipulations of the new British standard BS 5446, Components of Automatic Fire Alarm Systems for Residential Premises – Part 1: 1977, Point-Type Smoke Detectors, covering both "ionization chamber" and "optical" detectors, are reported.

201. Kleinschmidt H-P
GREATER RELIABILITY FOR AUTOMATIC FIRE DETECTION SYSTEMS
Ind Elektr + Elektron; 21(11):230, 1976 (German)

The increased sensitivity of modern fire detectors has resulted in an increase in the number of false alarms, but to reduce sensitivity is undesirable. A better approach is a technique which not only analyzes when a prescribed threshold has been reached, but also analyzes the time behavior of fire signatures. A new concept of signal separation for detectors is described that permits mixed rigging of detector systems with automatic and manually triggered detectors to achieve significant savings in installation, maintenance and operation. Often only half as many detectors are needed, so that smaller alarm stations with a lower power supply can be used. 4 figs.

202. Kobayashi T, Kato T and Ino H
FIRE PREVENTION AND SMOKE VENTING APPARATUS
Omron Tech; 16(2):123-132, 1976 (Japanese; English Summary)

The design, operating principle, basic tactical and technical parameters, and the results of operational tests of two complex fire-safety systems developed by the Nittan Company of Tokyo and mass-produced by Japanese industry since 1975 are described. The systems can be used for all purposes and can be installed in premises and buildings of all kinds. The RE-660 system operates as an automatic fire-seat detector, as a warning system with an emergency acoustic alarm, and as an automatic door opener in premises using a system of pneumatic and electric spring levers. The system operates from a 100-V a-c source with an industrial frequency of 50/60 Hz or a 24-V d-c source. The maximum current requirement for the a-c source is 10 mA and 1 A for the d-c source. The system design makes it possible to monitor 85 points in the premise being protected. The fire detectors of the system are designed for an actuation threshold of 70°C; the system as a whole is designed to operate in the −10 to +50°C range. The RE-4SH system is intended for automatic removal of smoke from premises during a fire by means of a system of smoke-removal chambers and powerful exhaust fans. The system is supplied with electrical power from a 24-V d-c source with a maximum current consumption of 0.4 A. The system is also designed for operation at an ambient temperature range of −10 to +50°C. Given in graphic form are the interrlations of the various modes. The design and operating principle of the monitoring and measuring apparatus, which is provided by the Nittan Company in each set and is intended for periodic functional testing of the system, are described. 13 figs, 1 table. (RZh)

203. Kobayashi T, Okushima A and Ino H

KD-310 SPOT SENSOR OF THE FIXED TEMPERATURE TYPE

Omron Tech; 16(2):96-102, 1976 (Japanese; English Summary)

The electrical circuit, design, operating principle, and principal technical parameters of the improved model of the KD-310 thermal fire detector, which has been mass-produced in Japan since 1975, are described. This sensor has a fixed actuation temperature of +60°C and is designed for use in premises and occupancies of any type having a standard ambient temperature of −10 to +40°C. Characteristic of this sensor is its small size, high reliability, and actuating sensitivity, based on the use of a heat-sensitive, bimetallic junction. The sensor is designed for power supply from a 0.1 A, 30 V a-c source and responds to an increase in ambient temperature at a rate of 75°C/min. The guaranteed service life of the sensor is 1000 operations. The methods and results of laboratory and operational tests of the sensor are described, as are the design and operating principle of the test stand used for this purpose, along with the monitoring and measuring apparatus. Also given are data on the manufacturing technology for this sensor, and several recommendations are made on the installation, servicing and operation of the sensor, either alone or as a constituent component of a complex fire alarm system. 15 figs, 1 table, 1 ref. (RZh)

204. Sato T, Murai K and Aoki S

FIRE ALARM RECEIVER

Omron Tech ; 16(2):103-110, 1976 (Japanese; English Summary)

A detailed description is given of the block diagram and operating principle of the electronic assembly of a P-type centralized fire monitoring system developed in several models by the Omron Teteishi Electronics Company of Japan for use in multi-branched, fixed fire safety systems that initiate warning signals and also signal commands to control a sprinkler subsystem. The KR-205 model of the control unit is all-purpose and can be used in combination with any type of peripheral fire detectors, as well as with effector devices joined to output terminals, which may be any kind of electromechanical drives or fire-warning components. The operation of a fire-warning set is examined that contains a KR-205 assembly supervising five independent fire detector nets simultaneously, two of them being KD-620 smoke detectors, the rest heat detectors with a fixed activation threshold of the KD-310 type. The electrical signal paths from the detectors to the control unit are examined, as are the qualitative and quantitative characteristics of the physical processes in wire communications, commutators, and individual subassemblies of the KR-205 unit. The front panel of the unit is provided with point indicators which permit visual monitoring of the fire status of the facility being protected. 4 figs, 3 tables. (RZh)

205. Anon

SELWICO-STROEMBERG FIRE ALARM SYSTEMS

Schiff Hafen; 28(11):1152-1153, 1976

The design of the Salwico-Stroemberg maritime fire alarm system, as well as planning for installation of the system for living quarters, machine compartments, and cargo holds are described. 1 fig.

206. Clardy LL and Stubblefield JC

ACOUSTICAL AND OPTICAL ALARM DEVICE

FRG Patent No. 2,205,921; Cl G08B 7/06, Appl 8 Feb 1972, Discl. 18 Mar 1976

The invention relates to an acoustical and optical alarm device arranged on the outside of a building and with actuating circuit closable by a switch located inside the building. The alarm is mounted in a pipe and has a photocell switch exposed to ambient light; the switch closes an illumination circuit containing a lamp when the ambient light reaches a predetermined intensity. Series-connected in the alarm circuit is the acoustic alarm, a flashing light switch, and a lamp. The pipe has an aperture to permit passage of the acoustic signals and a transparent cover to protect the illuminating and alarm lamp. The patented device combines a street lamp and a particularly effective individual alarm device. 6 claims, 2 drawing figs.

207. Poehlsen H and Beyersdorf H

FLAME DETECTION METHOD AND FLAME DETECTOR FOR IMPLEMENTATION OF THE METHOD

FRG Patent No. 2,108,052; Cl G08B 17/12, Appl 20 Feb 1971, Discl. 29 Mar 1976, Assignee: Preussag AG, Feuerschutz, FRG

The invention relates to a method of flame detection in which the flame radiation modulated by the flicker of the flames is measured and a detection alarm is given when the measured signal contains signal components in a flicker frequency range. In this method the time intervals between zero passages of the measured signal in the flicker frequency range are measured separately. The invention also relates to a flame detector for implementation of the method. 20 claims, 6 drawing figs.

5. FIRE PROTECTION OF STRUCTURES

b. Detection and Alarm—Continued

208. Hoene F, Hoene L and Schulze H
DEVICE FOR THE DETECTION OF IGNITION CENTERS IN MINERAL WOOL PRODUCTION SYSTEMS
GDR Patent No. 118,187; Cl G08B 17/12, G08B 37/00, Appl 3 Mar 1975, Discl. 12 Feb 1976, Assignee: Authors

The invention relates to a device for detecting ignition centers in mineral wool production systems in which temperature sensors are distributed over the entire width of the production line in the cold-air intake flow, one set of sensors being series-connected, the other set being connected grid-like in clusters. The function of the sensors is to detect smoldering or burning particles of the material being transported. The advantage of the device is that ignition centers can be detected either on the surface or within the materials. 2 claims, 2 drawing figs.

209. Morita Y
COMPLEX FIRE SAFETY SYSTEM
Japanese Patent No. 51-22319; Cl 95 A 0, (A62B 3/00), Appl 28 Dec 1970, Discl. 8 Jul 1976, Assignee: Author

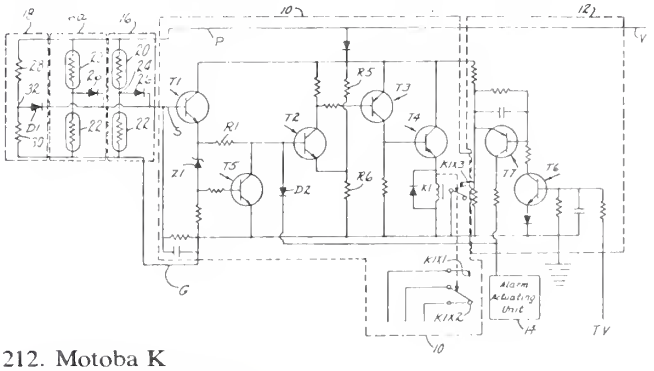
A patent is disclosed for the design and operating principle of a complex, automated, universal fire safety system for use in any type of premise. The system performs the following functions: detection of the outbreak of fire by means of a network of fire detectors, the initiation of visual and acoustic alarm signals by means of remote relay-controlled flashing lamps and electric sirens, actuation of the emergency exhaust (smoke-removal) ventilation system and automatic closing of fire curtains at windows by means of special electromechanical drive mechanisms. This system is controlled at a central control and indication station located in a special dispatcher's room. The system is highly reliable, and the design of the principal devices and assemblies is simple. It is pointed out that up to the present time only electric circuits, and also block diagrams of complex multi-purpose systems, have been patented in Japan, but this is the first time the design of such complex systems has been patented. 27 drawing figs. (RZh)

210. Nakamura M and Minakawa T
FLAME DETECTING UNIT
Japanese Patent No. 51-5310; Cl 111 F 15, (G01J 1/44), Appl 11 Apr 1969, Discl. 19 Feb 1976, Assignee: Matsushita Denki Sangyo KK, Japan

A patent is disclosed for an electrical circuit and operating principle of a highly reliable fire detector designed for independent use or as part of various fire safety systems. The detector contains two sensitive components, a flame-responsive photoresistor and a thermo-resistor, which responds to an increase in air temperature around the detector. The resistors are connected to the arms of a symmetrical electrical bridge; a variable-resistance trimming resistor and a constant-resistance ordinary resistor are connected to the other two arms of the bridge. The bridge arms are balanced by the trimming resistor so that in the permissible range of normal ambient temperatures the difference in resistance of the two sensitive components is compensated by the resistance of the variable resistor and a signal does not appear at the output terminals of the bridge (either a d-c battery or some other d-c source is constantly connected to the input terminals of the bridge). When a fire breaks out, the two sensitive components (the resistors) change abruptly, the balance of the bridge arms is disrupted, resulting in the appearance of a d-c signal at the output terminals. The signal is amplified in a d-c amplifier and is converted into an alarm signal. The simultaneous use of two sensitive components responding to different fire signatures enhances the operational reliability of the fire detector to a considerable degree. 2 drawing figs, 2 refs. (RZh)

211. Brennecke PWR, Ewe H and Justi EWL
DEVICE FOR TIMELY DETECTION OF COMBUSTION AEROSOLS
Swedish Patent No. 383,055; Cl G08B 17/10, Appl 22 Nov 1974, Discl. 23 Feb 1976, Assignee: Telefon A.C.M. Ericsson, Sweden

The patent relates to a device for the detection of small concentrations of aerosols generated during combustion. The operating principle is as follows: light from an incandescent lamp passes through an interference filter which transmits electromagnetic radiation with a wavelength of 1.76 microns, then through a measuring chamber, and impinges on a lead sulphate photoresistor having maximum sensitivity to this wavelength and forming one arm of the measuring bridge. The bridge is regulated such that in the normal state the voltage at its output is zero. A very small quantity of smoke reaching the chamber with the ambient air attenuates the electromagnetic radiation, leading to a change in resistance of the photocell and to unbalancing of the bridge. A voltage amplified by a differential amplifier appears at the output of the bridge to initiate an alarm. The lamp is supplied by a transistor current generator included in the circuit. It has been found that the device is especially sensitive to smoke generated during the combustion of PVC and does not respond to ordinary air-polluting aerosols. 3 claims, 1 drawing fig.



212. Motoba K
SMOKE DETECTOR
Swiss Patent No. 580,310; Cl G08B 17/10, Appl 11 Nov 1974, Discl. 30 Sep 1976, Assignee: Nohmi Bosai Kogyo Co Ltd, Japan

A smoke detector is disclosed that has a light source and a photoelectric cell responding to the light source as a function of the smoke density, several electrodes distributed along the ray path which are loaded with time-variable voltage, thus attracting charged smoke particles at time intervals and causing fluctuations in smoke density along the radiation path. Also provided is a device for evaluation of the fluctuations in radiation caused by the fluctuations in smoke density detected by the photoelectric device. 2 drawing figs.

213. Nakano N, Kurata K, Okuda Y and Tsunehiko A
SMOKE DETECTION SYSTEM
Swiss Patent No. 576,176; Cl G08B 17/10, Appl 19 Jul 1974, Discl. 31 May 1976, Assignee: Matsushita Electric Works Ltd, Japan

A patent is disclosed for a photoelectric smoke detector containing a light source and a photoelectric cell with light stops between them to prevent the light beams from striking the photoelectric receiver directly. When smoke particles penetrate the shielded space, the light beams reflected from the particles are picked up partially by the receiver and are transformed into electrical signals which are transmitted to the amplifier input. Signals from the amplifier output are transmitted to the fire alarm system. 14 drawing figs.

214. Atack J
IMPROVEMENTS IN FIRE DETECTION AND EXTINGUISHING SYSTEMS
UK Patent No. 1,436,137; Cl A5A, (A62C 37/12), Appl 7 Sep 1973, Discl. 19 May 1976, Assignee: Author

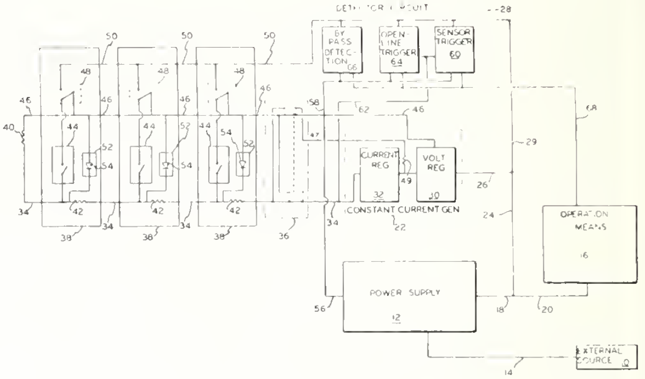
This invention relates to improvements in fire detecting and extinguishing devices of the type in which a weight is connected to a thermoplastic line cable or filament, one end of which is fixed to a stationary point and is adapted to fail structurally on heating to a predetermined temperature to release the weight. A fire-extinguishing system is proposed in which a second weight is suspended from arms on a bracket, the arms being arranged to be separated to release the second weight by a snatch cord or chain activated by the release of the first weight on the rupture of the line cable or filament. The second weight actuates a pressure gas cylinder to pressurize a second cylinder for the release of a powder or mist to blanket a fire. The object of this invention is to provide a fire detection and extinguishing system for high-ceilinged buildings with large open spaces. 3 drawing figs.

215. Fox B and Walker DJ
IMPROVEMENTS IN OR RELATING TO AUTOMATIC FIRE ALARM EQUIPMENTS AND SYSTEMS
UK Patent No. 1,446,613; Cl G4H, (G08B 25/00), Appl 18 Apr 1973, Discl. 18 Aug 1976, Assignee: Lab-Craft Ltd, Harold Wood, UK

This invention relates to automatic fire alarm equipment and systems adapted to respond automatically upon the occurrence of a fire at any of a number of predetermined positions in a building or complex and to indicate the position at which the fire has broken out at one or more central or control stations by radio signal. 4 drawing figs.

216. Berger PH
CONSTANT CURRENT DETECTOR SYSTEM
US Patent No. 3,991,413; Cl 340/267 R, (G08B 21/00), Appl 23 Jun 1975, Discl. 9 Nov 1976, Assignee: Author

A constant current generator supplies a constant current signal to a plurality of detector means via an output and ground return line. The detector means include an electrical resistance in series circuit in the output line and a sensor connected between the ground return line and the output line optionally subsequent in electrical circuit to the resistance. The sensor means becomes electrically conductive in the presence of a stimulus. As a result, the total resistance and, in turn, the voltage at the output of the constant current generator, changes to a predictable value indicative of the identity of the conducting sensor. A detector circuit senses the change in voltage and sends a detection signal to activate operation means. 13 claims, 4 drawing figs. (Author)



217. Castanino JJ, Lotus JW and Meade AJ
METHOD AND APPARATUS FOR DETERRING FALSE ALARMS
US Patent No. 3,986,184; Cl 340/304, (G08B 29/00), Appl 17 Jun 1975, Discl. 12 Oct 1976, Assignee: False Alarm Deterrent Corp, E Bridgewater, MA

A series of finger-operated button switches is employed in conjunction with a logic circuit to control the mechanical activation of a conventional alarm box mechanism. When the finger button switches are pressed to activate the alarm, the user's fingerprints are retained on the switch buttons. Upon actuation of the alarm, the fingerprint-bearing button switches are retracted to a position in which they are inaccessible to the alarm user. An electrical "flesh" sensor is provided on at least one finger button to prevent actuation of the alarm by means other than a human finger. In the event of a power failure, the conventional alarm mechanism can be actuated by mechanical pressure on a thumb button switch. In the preferred embodiment, the finger-actuated button switches are located within a housing that can be retrofitted to existing alarms, such as fire alarm telegraph boxes. 32 claims, 7 drawing figs. (Author)

218. Conville DJ and Crane BJ
COMBINATION DOOR CHIME AND PARTICULATE PRODUCTS-OF-COMBUSTION DETECTOR
US Patent No. 3,982,237; Cl 340/237.5, (G08B 17/10), Appl 28 Feb 1975, Discl. 21 Sep 1976, Assignee: Rixson-Firemark, Inc, Franklin Park, IL

5. FIRE PROTECTION OF STRUCTURES

b. Detection and Alarm—Continued

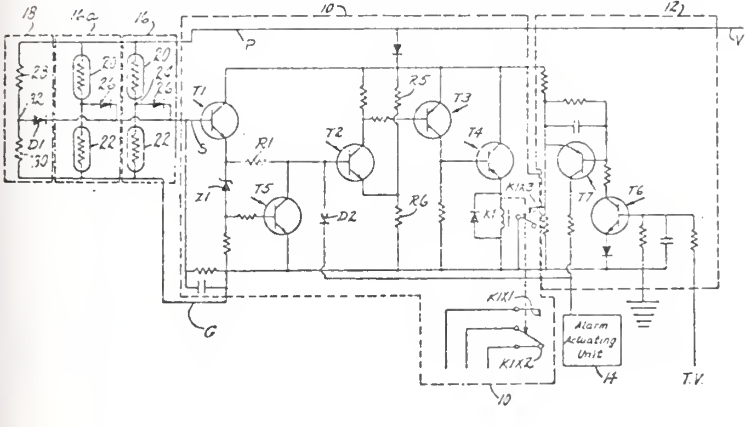
This patent relates to a combination door chime and detector responsive to the particulate products of combustion passing through multiple passageways formed in the chime cover. The door chime includes conventional spaced tone bars each cooperating with a tuned resonator chamber. A tone bar striker mechanism capable of single-note, two-note, and sustained-repetitive note striking of the tone bars is disposed between the tone bars. A photoelectric particle products of combustion detector is also disposed between the tone bars. The conventional low-voltage door and chime transformer serves as a power supply for both the combustion detector and the striker mechanism. The closing of a first remote door chime switch generates a single-note signal; the closing of a second remote door chime switch generates a two-note signal; and the detection of the particulate products of combustion generates a sustained-repetitive note which serves as an intense audible alarm. An optional voltage comparator and signal gate serves to generate a pulsing repetitive signal with a relatively large time interval between successive pulses. This fourth signal indicates a malfunctioning of the particulate products of combustion detector. 9 claims, 13 drawing figs. (Author)

219. DiPaula V, Jr and Casseri JL
FIRE ALARM PROTECTION BOOTH
US Patent No. 3,996,580; Cl 340/304, (G08B 25/00), Appl 24 Jun 1975, Discl. 7 Dec 1976, Assignee: Fire Alarm Marketing Corp, Towson, MD

A fire alarm and protection enclosure in the form of a booth or box having means therein for signalling an alarm to a fire station and/or police station is disclosed. The enclosure includes a door and a treadle upon which a person must stand and close the door, which is then automatically locked upon actuating the alarm, which door remains locked to detain the person setting off the alarm for a predetermined period. Electrical interlock circuitry interconnected with the door, the treadle, and the door lock renders the apparatus fool-proof or tamperproof so that false alarms are prevented. 18 claims, 2 drawing figs. (Author)

220. Doherty WF
DETECTOR SYSTEM
US Patent No. 3,988,725; Cl 340/228 R, (G08B 17/12), Appl 12 Dec 1973, Discl. 26 Oct 1976, Assignee: Pyrotector, Inc, Hingham, MA

A detector system is disclosed that is particularly adapted for use in installations where the supply voltage is subject to wide variations. It comprises a detector which produces a voltage in response to a condition to be detected, a supervisory circuit, and an alarm actuator, in which the voltage signal produced by the detector when the predetermined condition exists varies in proportion to line voltage, the alarm actuating means produces an alarm when the input signal rises to a predetermined percentage of the line voltage, and the supervisory circuit applies to the signal lead a supervisory voltage which also varies in proportion to the variation of line voltage. 6 claims, 3 drawing figs. (Author)

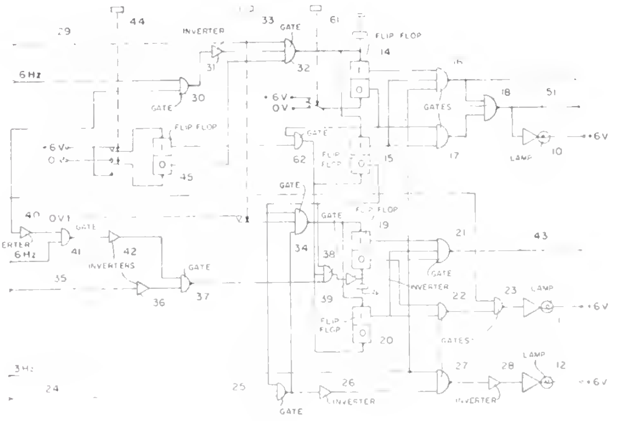


221. Hemme F
AUTOMATIC FIRE ALARM AND EXTINGUISHING DEVICE
US Patent No. 3,990,518; Cl 169/60, (A62C 37/18), Appl 13 May 1975, Discl. 9 Nov 1976, Priority: FRG, Appl No 2423447, 14 May 1974, Assignee: Siemens AG, Berlin and Munich, FRG

An automatic fire alarm and extinguisher device is in the form of a fire protection unit comprising fire alarm means, preferably a smoke alarm and a heat or flame alarm, valve for controlling an extinguisher fluid, means for controlling the valve in response to action of the respective alarms, all of which is disposed in a common protective housing, and at least one extinguisher fluid outlet head. The unit may be connected to a central station over a monitored line and, where a plurality of outlet heads are employed for respective adjacent zones, the zones, by suitable disposition of the outlet heads, may overlap. 9 claims, 5 drawing figs. (Author)

222. Hillberg AV
MULTI-SUBSCRIBER ALARM SYSTEM WITH CENTRAL RECEIVING AND TRANSMITTING INSTALLATION
US Patent No. 3,991,412; Cl 340/213.2, (G08B 25/00), Appl 14 Feb 1975, Discl. 9 Nov 1976, Priority: Sweden, Appl No 7402133, 19 Feb 1974

An alarm system is disclosed for a number of individual subscribers connected to a central installation in which



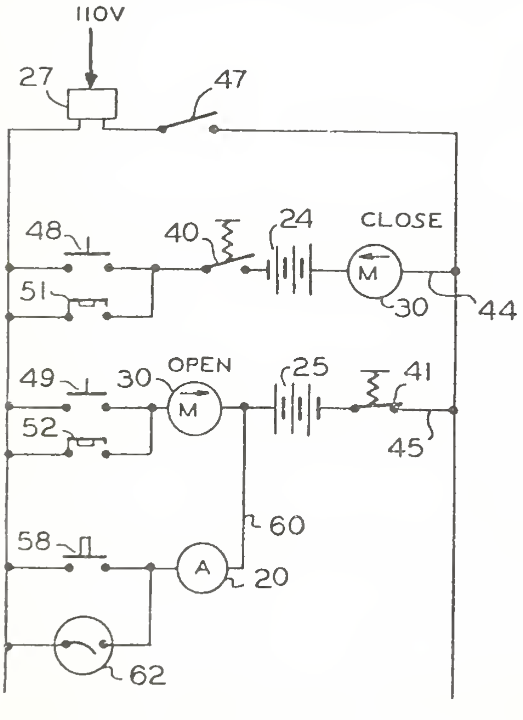
each subscriber can signal the central installation when help is needed and the central installation can signal back to the subscriber indicating receipt of the call. The subscriber can make further calls and receive signals from the central installation in return. Alarm systems are known having multiple subscribers to a central processing station. These alarms are generally in use for burglar and fire protection. However, the equipment used in such installations are merely alarms from the subscriber to the station and do not have the possibility of a two-way contact between the individual subscribers and the central station. 6 claims, 4 drawing figs. (Author)

223. Jolley L

BURGLAR AND FIRE ALARM SYSTEM

US Patent No. 3,968,483; Cl 340/274 R, (G08B 13/08), Appl 8 Jan 1975, Discl. 6 Jul 1976

A security alarm system for a building includes rechargeable battery-operated alarm circuitry, with the system including a burglar alarm in conjunction with an entrance door. Inside switches selectively activate the system and operate an electric motor to slide a door bolt between open and closed positions. With the door bolt closed, anyone attempting to retract the door latch closes a latch-operated switch in the alarm circuit, setting off the alarm. Magnetic switches embedded within the outside wall of the building at secret locations are operable from outside the building by touching the proper pole of a magnet to the proper secret spot on the wall to close the bolt and activate the system or open the bolt and deactivate the system to permit authorized entry from outside. The system also includes heat-sensing switch means in the alarm circuit for sounding the alarm in the event of fire, smoke or heat without the necessity of activating the magnetic or inside switches. 9 claims, 4 drawing figs. (Author)

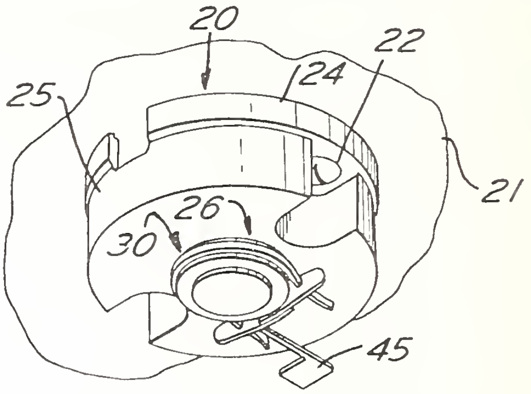


224. Levy A

ACTIVATION INDICATOR FOR A FIRE DETECTOR

US Patent No. 3,971,333; Cl 116/114.5, (G01K 1/14), Appl 28 Mar 1975, Discl. 27 Jul 1976

This patent relates to an activation indicator for a fire detector wherein fusible securing means, such as solder, or the like, is fixed to and positions an attachment member in proximate heat exchange relation with a fire detector, and resilient means is connected to the attachment member urging the latter out of its heat exchange position, elevated temperature serving to melt the securing means and free the attachment member for movement by the resilient means out of its original position, to thereby indicate activation of the fire detector by the elevated temperature. 7 claims, 13 drawing figs. (Author)



225. Nakano T, Kurata K, Okuda Y and Araki T

LIGHT SCATTERING TYPE SMOKE DETECTOR

US Patent No. 3,985,453; Cl 356/207, (G01N 21/12), Appl 19 Jul 1974, Discl. 12 Oct 1976, Assignee: Matsushita Electric Works, Ltd, Osaka, Japan

A light-scattering type smoke detector minimim in size and protected from erroneous operation and from internal accumulation of water drops is provided. The optical system comprises light emitting and receiving elements and light shielding means which are compactly mounted on a base plate at different heights so as normally to prevent light from the emitting element to reach the receiving element. A power source part for the light emitting element disposed at one side of the optical system and an amplifying part for the light receiving element disposed at the other side of the system are housed in an upper lid having drain means, and a lower lid having many small holes for smoke lead-in is attached to the upper lid. 7 claims, 15 drawing figs. (Author)

226. Roe RF

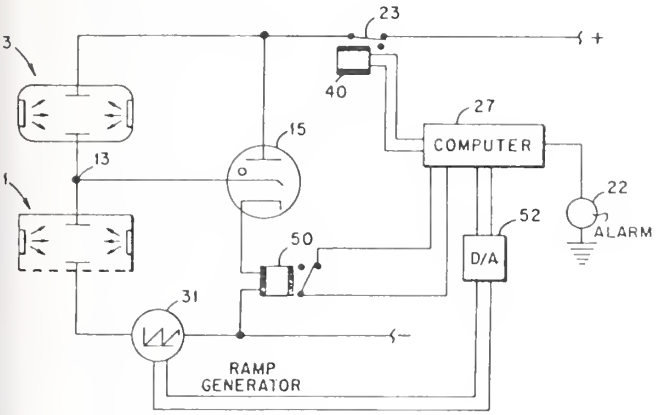
IONIZATION-CHAMBER SMOKE DETECTOR SYSTEM

US Patent No. 3,987,423; Cl 340/237 S, (G08B 17/10), Appl 22 Dec 1975, Discl. 19 Oct 1976, Assignee: US Energy Res and Dev Admin, Washington, DC

5. FIRE PROTECTION OF STRUCTURES

b. Detection and Alarm—Continued

This invention relates to an improved smoke-detection system of the ionization-chamber type. In the preferred embodiment, the system utilizes a conventional detector head comprising a measuring ionization chamber, a reference ionization chamber, and a normally non-conductive gas triode for discharging when a threshold concentration of airborne particles is present in the measuring chamber. The improved system is designed to reduce false alarms caused by fluctuations in ambient temperature. Means are provided for periodically firing the gas discharge triode and each time recording the triggering voltage required. A computer compares each triggering voltage with its predecessor. The computer is programmed to energize an alarm if the difference between the two compared voltages is a relatively large value indicative of particles in the measuring chamber and to disregard smaller differences typically resulting from changes in ambient temperature. 10 claims, 4 drawing figs. (Author)

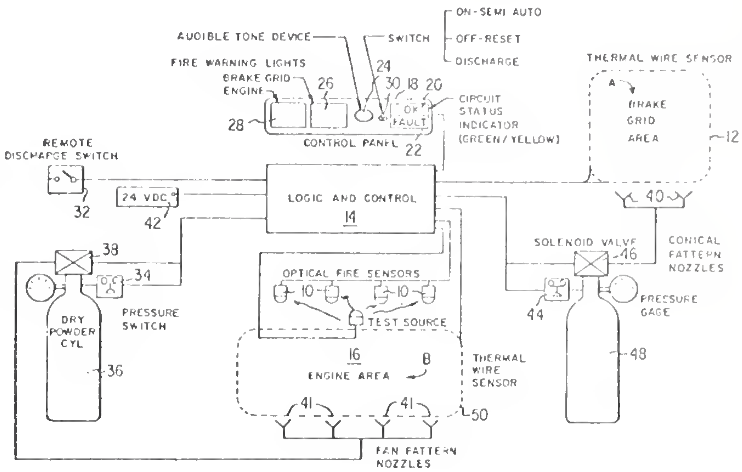


227. Stevens RB and Oda WS

FIRE PREVENTION SYSTEM

US Patent No. 3,993,138; Cl 169/61, (A62C 37/22), Appl 24 Apr 1975, Discl. 23 Nov 1976, Assignee: USA, Secretary of the Interior, Washington, DC

An automatic fire prevention system provides failsafe features as well as the capability of checking the operation of associated fire sensors. Multiple fire sensors, including thermal and optical types, are continually checked by a test circuit which simulates fire conditions. Detection of an actual fire causes an automatic control circuit, after a predetermined time delay, to activate a fire extinguishing device such as a dry powder chemical extinguisher. Logic circuitry distinguishes between true fires and fires simulated by the aforementioned test circuit. An operator can by-pass the automatic activation of the fire extinguishing device by means of a manual switch during the time delay period and can also manually discharge the fire extinguisher. Applications include the protection of mine haulage trucks so as to provide automatic fire extinguisher activation, continued self-checking and manual override features for a driver. 15 claims, 6 drawing figs. (Author)

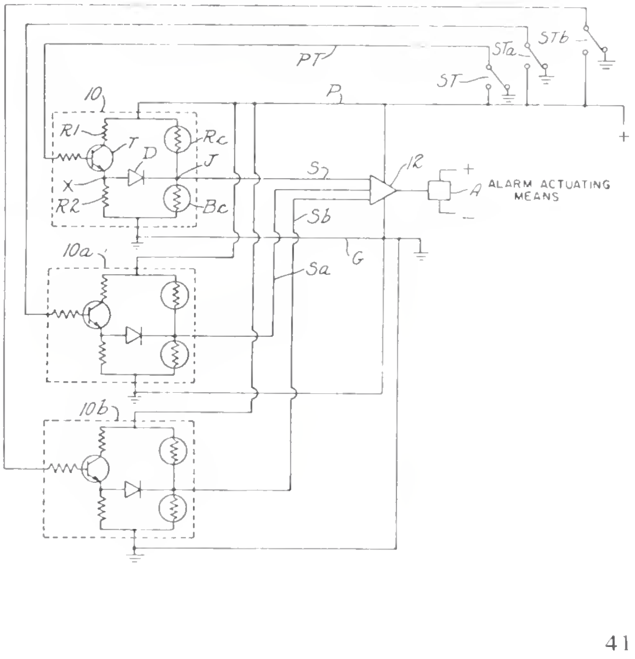


228. Tufts HL

FIRE DETECTION SYSTEM

US Patent No. 3,983,548; Cl 340/228 R, (G08B 17/06), Appl 19 Feb 1975, Discl. 28 Sep 1976

Disclosed is a fire detection system of the type utilizing an optical detector with discriminating photo-cells connected in series to form a voltage divider. The rise in voltage at the junction of the photo-cells is used at the input to an amplifier to energize an alarm or activate an extinguishing system, in which a remotely controlled switch is provided for applying to the signal lead at the



detector a test voltage from the remote end of the power lead at the detector, whereby both the continuity of the power lead, the continuity of the signal lead, and the operativeness of the power supply are tested. 8 claims, 3 drawing figs. (Author)

229. Ivanov YuB, Mitrofanov VA and Mikhaylova GF
ALARM DEVICE
USSR Patent No. 512,482; Cl G08B 1/08, Appl 1 Oct 1974, Discl. 10 Jun 1976

The device contains sensors of the status of the premises being supervised with outputs coupled to the corresponding inputs of the commutator and a synchronization assembly, one output of which is connected to the inputs of the commutator and to one of the inputs of the continuous-indication unit, while another output is connected across a frequency divider and a first switch to the other input of the continuous-indication unit.

230. Meshman LM, Veselov AI, Kuznetsov NP, Vaynshteyn BI, Galadzhiy FM and Zenin VI
DEVICE FOR RECORDING AN EMERGENCY STATUS IN FIRE AND EXPLOSION PROTECTION SYSTEMS
USSR Patent No. 504,219; Cl G08B 17/06, Appl 19 Dec 1974, Discl. 9 Jul 1976, Assignee: VNII Protivopozhar Oborony

The device consists of a photoelectric converter connected across an amplifier to the input of a pulse former, a counter and a time relay. In order to increase the operating reliability of the device, it includes a switching component, a signal apparatus and a detonator with one lead of the signal apparatus connected to the detonator; another lead is connected across the time relay to one of the inputs of the switching component; a third lead is connected to the output of the pulse former. The output of the switching component is connected to the counter.

231. Sergeev GM, Metyelkin GA, Aver'yanov VM and Lysikov AI
FIRE ALARM DEVICE
USSR Patent No. 516,081; Cl G08B 17/06, Appl 19 Dec 1974, Discl. 9 Jul 1976, Assignee: VNII Protivopozhar Oborony

The device consists of a terminal assembly associated with a three-wire communications line installed in the premise being supervised and parallel-connected detectors; a monitoring assembly at the control panel, linked to the three-channel communications system and consisting of a set of parallel-connected selector cascades; and a stabilized power source with an overload protection unit. In order to simplify the device and to increase the signal selection reliability, the monitoring assembly contains a circuit formed from parallel-connected measurement and semiconductor components coupled to the signal bus of the three-wire line parallel to the inputs of the set of selector cascades and a terminal assembly consisting of a transistor with collector-emitter circuit series-connected across the resistor and signal bus to the measurement component and a base-emitter circuit across a resistive voltage divider to the power-supply bus of the three-wire detector line.

232. Rodgers SJ
ANALYSIS OF NONCOAL MINE ATMOSPHERES. MSA Res Corp, Evans City, PA; BuMines OFR-78-77, 121 pages, May 1976
Availability: NTIS PB-266 764/0GA

The quantity and behavior of gases in metal and nonmetal mines were monitored to provide background information on feasibility of incipient fire detection systems. Monitoring was conducted during working and nonworking periods at intake air, return air, and working places. Gases generated during diesel operations and shot firing were of particular interest. Gases that were monitored were CO, CO_2, NO, NO_2, and SO_2. Submicrometer particulate concentrations were also monitored. Commercially available instruments were used and included nondispersive infrared, electrochemical, and chemiluminescent types. The ratios of the various gases generated during diesel operations and shot firing were similar to those expected from an incipient fire, except for the CO_2/NO_x ratio, which was sufficiently different to be considered for early fire warning. Samples taken near leaking bulkheads showed high CO_2 levels, and low CO levels, and reverse of anticipated behavior in coal mines.

233. Harpe SW, Waterman TE and Christian WJ
DETECTOR SENSITIVITY AND SITING REQUIREMENTS FOR DWELLINGS — PHASE 2. FINAL REPORT. IIT Res Inst, Eng Mech Div, Chicago, IL; IITRI J6340, NBS GCR-77-82, 379 pages, Feb 1977
Availability: NTIS PB-263 882/3GA

The contract for a field investigation of the effectiveness of residential smoke detectors was extended to cover 36 additional tests investigating details not completely covered in the first report. The objective of the second phase of the program was to gather information on fires under summer/fall conditions without air conditioning and to expand available information on high volume, two-story structures. The effects of open windows, new technical developments in photoelectric detector design, and the response of semiconductor-type residential gas detectors and mechanically powered heat detectors were also included. (Author)

234. Bukowski RW
FIELD INVESTIGATION OF RESIDENTIAL SMOKE DETECTORS. Nat Bureau Standards, Washington, DC, 4 pages, May 1977
Availability: NTIS PB-266 484/5GA

A test program was undertaken to investigate the operation of residential smoke detectors under actual field conditions. The main objectives were to determine: 1) minimum sensitivity; 2) best location; and 3) escape time provided by a group of typical detectors. Instrumentation was used to determine theoretical response times of an "ideal" detector as a base line for evaluation of detector performance. The tests were conducted using smoldering or flaming ignition of sofas, chairs, and mattresses in various rooms in two abandoned, single-family houses scheduled for demolition. Work was carried out during winter and summer seasons with central heating and cooling on and off. (Published in *Southern Build*, pp 28-31, Apr/May 1977.)

5. FIRE PROTECTION OF STRUCTURES

b. Detection and Alarm—Continued

235. Hertzberg M, Litton CD and Garloff R
STUDIES OF INCIPIENT COMBUSTION AND ITS DETECTION. US Dept Interior, BuMines, Pittsburgh Mining and Safety Res Center, PA; BuMines RI-8206, 25 pages, 1976
Availability: NTIS PB-263 903/7GA

The early and reliable detection of the self-heating of combustible substances in mines is of considerable importance to the mining community. This Bureau of Mines report describes the results of a variety of studies of incipient combustion and its detection. Heated samples of coal, wood, and various polymers were used to evaluate the relative sensitivities of several types of detectors. The laboratory results indicate that submicron particulate detection is the most universal and sensitive method. Carbon monoxide detection was as sensitive for pyrolyzing coal, but was relatively insensitive to pyrolyzing wood or plastics. The conventional type of ionization smoke detector was the least sensitive for coal and of intermediate sensitivity for wood and plastics. Self-heating experiments with Pittsburgh Seam coal piles of varying particle sizes gave ignition temperatures of 170°C for 4-7 micrometers dust, which increased monotonically with particle size. The measured heating rates were compared with data from an adiabatic calorimeter to obtain preexponential rate constants. These varied linearly with the surface area per unit mass of sample. (Author)

c. EVACUATION MEANS AND ESCAPE SYSTEMS

236. Stapelfeldt JP
TRIAL PERIOD FOR ESCAPE BALCONIES
Brandschutz; 31(2):47-48, 1977 (German)

The author puts forth some points for a discussion of the theme of escape balconies. A number of clear advantages, even in areas other than fire protection, are confronted by a large number of disadvantages, not the least of which is the private action of transforming them into living-area balconies, thus blocking the escape route. In office and administrative buildings, problems of air-handling equipment oppose the possibility of using the escape balcony at all times. In practice, however, escape balconies have already proved their worth. 2 figs. (Fachdok 13/0486)

237. Czejka F
THE LINZ RESCUE BELT
Brandschutz; 31(4):108-109, 1977 (German)

The simple design of this belt makes it possible to put it on very rapidly and safely, even in a limited space (all kinds of shafts), and assistants do not even have to be very skillful. The principal component of this "Linz rescue belt" are two leg loops with five size settings, at the end a half-ring for attachment by snaphook on a line, 2 wide (85 mm) straps (a chest and head strap), and 2 narrow (45 mm) straps (for hands and legs), and a PVC bucket, which can be used both as a head protector and as a storage container. 8 figs. (Fachdok 13/0692)

238. Cox RLF [*Nat Assoc Hosp Fire Officers, UK*]
EMERGENCY EVACUATION OF PATIENTS IN HOSPITAL
Fire; 69(863):625-627, 1977

Considerable space is devoted in this article to the desired width of doors along evacuation routes, to evacuation rates through exits, and to emergency methods of evacuating patients, such as the blanket drag, by mattress, by chair, etc. Other aspects affecting evacuation are the fire-resistance of doors and wards, warning systems, personnel training, and the like.

239. Kozlowski L [*Swissair, Switzerland, Dept Operations/Flight Techniques*]
EVACUATION PROCEDURES AND CREW TRAINING
Flight Internat; 5(54):85-87, 1976 (English, French, German; Spanish Summary)

Several points regarding the preparation of sensible evacuation procedures and the training of flight crews in carrying them out properly are pointed out. Inadequate passenger briefing is criticized. Suitable ground equipment permitting speedy removal of passengers is recommended. Overwing exits should be attended by personnel during the take-off and landing. Loose ceiling panels, life rafts, and hand baggage are identified as hazards. Cabin attendants should equal the number of doors and overwing emergency exits. (This article is an abridged version of a paper presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.) 1 fig.

240. Enomoto K, Hatakeyama T, Horii K and Konishi M
DEVELOPMENT OF WATER-FILLED RESCUE STRUCTURES
Fire Sci Lab Japan. Rep; (13):61-65, 1976 (Japanese)

Several of the most advanced versions of water-filled rescue structures used to evacuate people and property from windows of burning multistory buildings in Japan are described. As a rule, these structures are in the shape of an irregular pyramid, which gives them the required stability and makes it possible to place the main operational level as close as possible to the burning building. It is pointed out that these structures have proved to be the most effective means of evacuation during fires in multistory buildings. The load-bearing frame is formed by rubber pipes interconnected in a certain fashion with a common nozzle for connection to a hydrant, wall hydrant, or pump of a fire vehicle. When not in use they are relatively compact and weigh only about 95 kg. They can be made ready for use, in principle, by only one man. The results of tests of these structures show that the total time needed to fill them with water in a range of pump pressures of from 1.5 to 4.0 kg/cm^2 and, consequently, to make them fully operational was from 18 to 39 sec. The main working level of these structures is formed by four rubber tubes in the shape of a trapezoid spanned by vertical and horizontal rope cables somewhat like a rope ladder. People and property are evacuated using these cables, which are connected into units at points of intersection. The maximum loads that can be applied at different points without deforming the pressurized rubber components forming the frame of the structure were determined during the tests. (RZh)

241. Kato K, Shima M, Adati I and Konishi M
NEW LIFE-SAVING AIR MATTRESSES. PART 2
Fire Sci Lab Japan. Rep; (13):52-60, 1976 (Japanese)

5. FIRE PROTECTION OF STRUCTURES

c. Evacuation Means and Escape Systems—Continued

The design, operating principle and results of testing a new prototype of an inflatable rescue mattress designed for use in building fires are described. The mattress effectively absorbs the shock of people and property thrown from the windows of a burning building. In the working state the mattress has the shape of a rectangular parallelogram with dimensions 7 x 5 x 2.7 m and a weight of about 100 kg. The mattress is in two sections, divided by a partition located 0.7 m from the bottom of the mattress, thus making the upper section 2 m in depth. The side of the bottom section has 3 nozzles for connecting the mattress to a compressor, air cylinder, or some other device to inflate the rubber shell of the mattress. The partition that divides the mattress into 2 sections has two openings, that is, diaphragms which can be either open or closed, depending on the circumstances; either the entire mattress is inflated (94.5 m^3), or only the bottom (smaller) portion. The mattress kit also contains a small 500 W compressor to supply air at the rate of 60 m^3/min. 12 figs, 3 tables. (RZh)

242. Dupeyroux RL

INFLATABLE PNEUMATIC MATTRESS FOR RESCUE OF PERSONS IN CASE OF FIRE OR SHIPWRECK AS WELL AS SERVING AS A SAFETY DEVICE IN WATER GAMES

French Patent No. 2,277,600; Cl A62B 1/22, Appl 11 Jul 1974, Discl. 6 Feb 1976, Assignee: Author

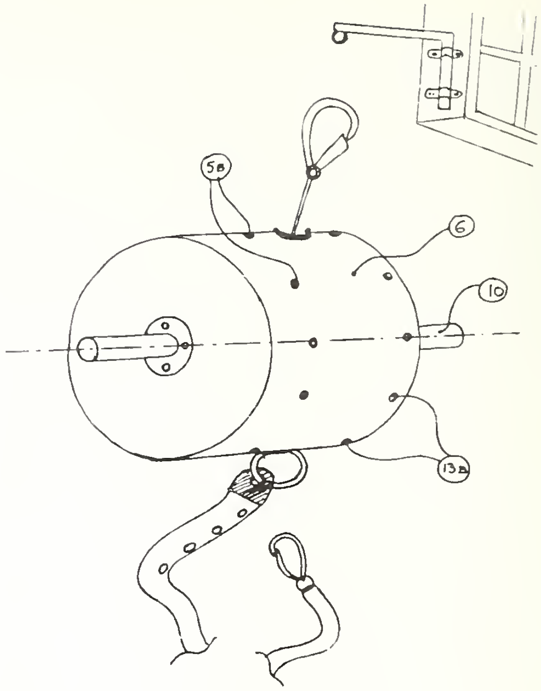
The patent relates to the use of large-scale mattresses made of strong rubberized fabric to rescue people from the upper stories of burning buildings. The device is capable of cushioning the fall of a person weighing 85 kg from a height of 25 m. The absence of any kind of rigid frame components rules out the possibility of injury. The mattress is filled by a compressor or a special compressed-air cylinder. The inner space is divided into segments by partitions made of the same material as the shell. Thus, if the shell is damaged, the mattress will not deflate completely. 1 drawing fig. (RZh)

243. Marietta JJ

FIRE RESCUE DEVICE

French Patent No. 2,278,354; Cl A62B 1/08, Appl 28 May 1974, Discl. 13 Feb 1976, Assignee: Author

A patent is disclosed for a device for the individual escape of people in case of fire in highrise buildings. The device is a large metal cylinder with flat ends. The rounded portion contains an opening through which a cable with a snaphook on the end passes. On the opoosite side of this opening is fixed a ring with a safety belt. A shaft runs through the axis of the cylinder forming handles. Inside the cylinder are two drums: the cable is wound on one drum, the other is provided with an inertial balance weight. Increasing the mass of the weight accelerates the motion of the first drum which, by increasing the rotational speed of the second drum and, consequently, the centrifugal force, increases the braking force, making the device self-controlling, that is, not requiring control of the rate of descent. To hold the device is place by means of the cable, each window opening is provided with a wall-mounted bracket and a ring. 2 drawing figs.



244. Esser K

DEVICE FOR INDICATION OF ESCAPE ROUTES

FRG Patent No. 2,438,826; Cl G09F 25/00, Appl 13 Aug 1974, Discl. 29 Apr 1976, Assignee: Klaus Esser KG, FRG

A patent is disclosed for the identification of emergency exits and evacuation routes, primarily in public-access buildings. The device contains directional acoustic signalling components arranged in a specific pattern along the walls of corridors, stairwells, and other evacuation routes. Since light signals above emergency exits are usually quite weak, are difficult to see and to make out when premises are filled with smoke, eg, theaters or movie houses, there is a real danger of panic with all its tragic consequences. In case of fire or disaster, acoustic signals have a definite advantage over light signals. 4 drawing figs.(RZh)

245. Katsube A

DEVICE FOR EVACUATION OF PEOPLE FROM HIGH-RISE BUILDINGS DURING A FIRE

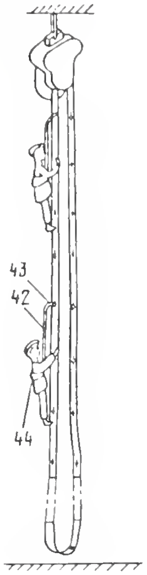
Japanese Patent No. 51-6479; Cl 95 C 2, (A62B 1/12), Appl 3 Mar 1969, Discl. 27 Feb 1976, Assignee: Author

A patent is disclosed for a simple mechanical device for the operational, safe evacuation of people from the windows of highrise buildings during a fire. The device comprises a long flexible ladder in the form of an "endless" closed chain and a system of blocks and clamps assembled in a compact metal housing. The housing through which the ladder passes (see the figure) is normally suspended from a bracket on the roof or in the upper portion of the wall of a building. In case of fire, the free end of the folded ladder is dropped, taking up a vertical position along the wall in line with the windows.

5. FIRE PROTECTION OF STRUCTURES

c. Evacuation Means and Escape Systems—Continued

The escape ladder can be used by people on every floor of the building. Also provided for safe evacuation are additional support straps, consisting of a belt (44), a line (42), and a hook (43). The block-and-clamp system ensures smooth descent to the ground. 11 drawing figs, 3 refs. (RZh)



246. Takami M

DEVICE FOR EVACUATION FROM HIGH-RISE BUILDINGS IN CASE OF FIRE

Japanese Patent No. 51-3156; Cl 95 C0, (A62B 3/00), Appl 14 Jul 1972, Discl. 31 Jan 1976, Assignee: Mitsui Josen KK, Japan

The invention relates to the design and operating principle of a device for the operational evacuation of people and property from the windows of a high-rise building during a fire. The device is an extensible suspended gangplank, the two ends of which, when in use, extend to the window openings of the building being evacuated and of a building located on the opposite side of the street or any other building located next to it with windows parallel to those of the burning building. The extensible gangplank, together with a system of suspension cables, makes it possible to transfer to the windows or roof of a facing building. 3 drawing figs. (RZh)

247. Tazaki S

RESCUE DEVICE

Japanese Patent No. 51-39039; Cl 95 C 1, (E06C 1/00), Appl 7 May 1969, Discl. 21 Oct 1976

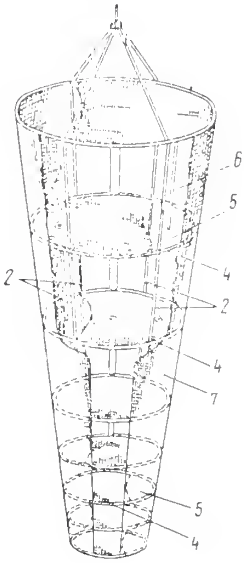
The design and operating principle of a mechanical system designed for operational evacuation of people from windows of multi-story (and low-rise) buildings are disclosed in this patent. The system consists of one or several modules suspended vertically along the wall of a building by a block and cable assembly. 12 drawing figs, 2 refs. (RZh)

248. Fitzgerald JG

FIRE ESCAPE

UK Patent No. 1,434,366; Cl A5A 44 50, (A62B 3/00), Appl 12 May 1972, Discl. 5 May 1976, Assignee: Secretary of State for Defence, London

The present invention relates to fire escapes, especially to portable or collapsible fire escapes. A fire escape according to the present invention comprises a plurality of platforms successively attached by flexible linking means and each having an aperture through which a human being can pass, the arrangement being such that when the escape is deployed, the platforms are such a distance apart that a person can readily lower himself from one stage to the next, and the aperture in one platform does not overlie the aperture in the next. 12 claims, 1 drawing fig. (Author)



249. Green WS

IMPROVEMENTS IN OR RELATING TO RESCUE APPARATUS

UK Patent No. 1,434,832; Cl A5X, (A62B 5/00, A61G 1/00), Appl 4 May 1973, Discl. 5 May 1976, Assignee: Author

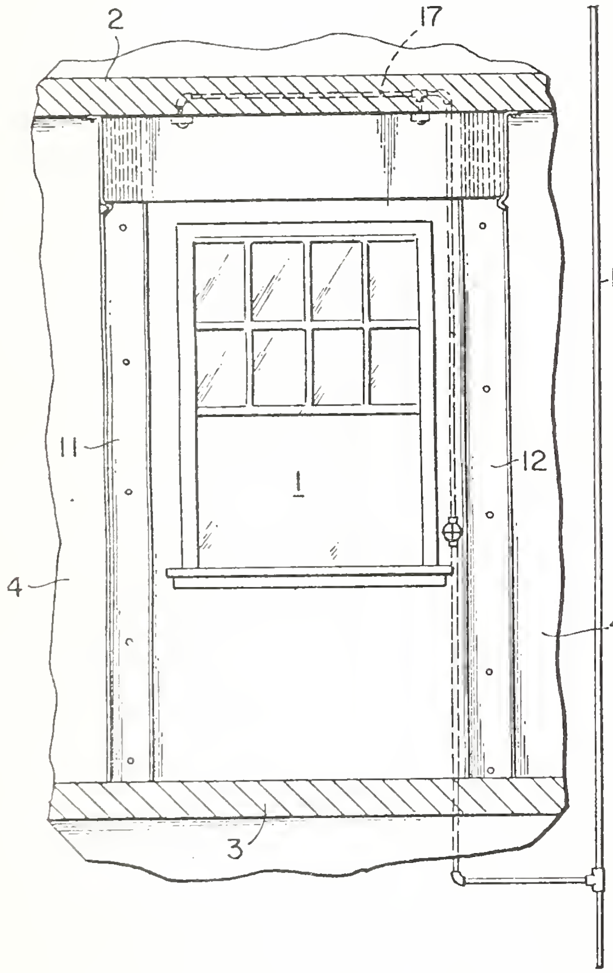
This invention relates to a rescue apparatus for rescuing immobile persons, such as hospital patients, from hazardous conditions, such as a hospital when on fire. A mattress-sized nylon or canvas sheet, reinforced with straps and grips of the same material, the straps being provided with quick-releasing buckles, is in position under the mattress with straps buckled under the bed. In case of an emergency, such as a fire, the straps are unbuckled, the sheet plus mattress and bedding are wrapped around the patient, the straps are buckled into position, and the patient is dragged to safety.

250. Nitu JE

FIRE ESCAPE DEVICE

US Patent No. 3,986,559; Cl 169/48, (E05F 15/20), Appl 7 Aug 1975, Discl. 19 Oct 1976, Assignee: The Raymond Lee Org, Inc, New York, NY

A number of sections of fireproof material are movably mounted on the ceiling of a room in the area of a window in the room. The sections are shaped to enclose a predetermined area around the window. One of the sections is affixed to the ceiling and the remaining sections are movably mounted in coupled and cooperative relation with the one of the sections and with each other. In stored condition, the sections are in a minimum area in abutment with the ceiling and spaced from the floor. In extended condition, the sections form a continuous partition from ceiling to floor at a predetermined distance from and around the window and abut the wall at a predetermined distance from both sides of the window, thereby isolating a pre-determined area around the window from fire. A latch device releasably maintains the sections in stored condition and permits the sections to extend to the extended position when the latch device is released. 3 claims, 8 drawing figs. (Author)

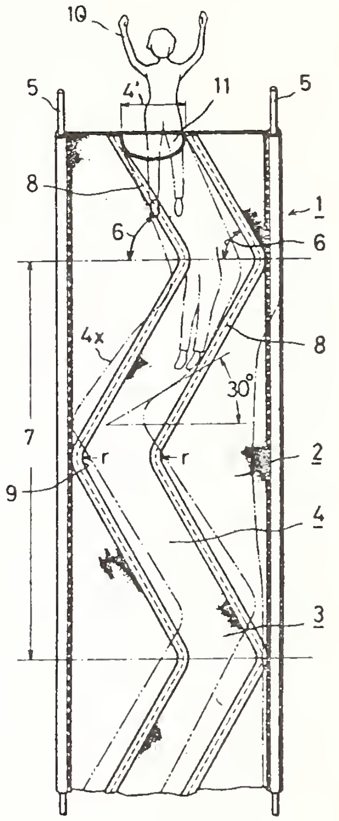


251. Okuma M, Sato M, Narita M, Sugimoto T, Ishihara M and Yagi H

SLIP-DOWN WAY EMBARKING DEVICE (RESCUE CHUTE)

US Patent No. 3,994,366; Cl 182/48, (A62B 1/20), Appl 1 Nov 1974, Discl. 30 Nov 1976, Priority: Japan, Appl No. 49-34660, 49-34661, 27 Mar 1974, Assignee: Fujikura Rubber Works Ltd, Tokyo, Japan

Disclosed is a novel slip down way embarking device (chute) used in an emergency on ships or other structures to transfer the passengers to a life raft or other lifesaving apparatus, safely and rapidly, said device comprising a tubular chute made of a vertical section of elongated cloth, a zigzag passage formed within said chute, a slip way attached to the lowermost end of said zigzag passage, a floating platform positioned under said chute and slipway to receive the escaping persons thereon, and a container to store the above device from which it can be lowered in an emergency without trouble and difficulty. 26 claims, 35 drawing figs. (Author)

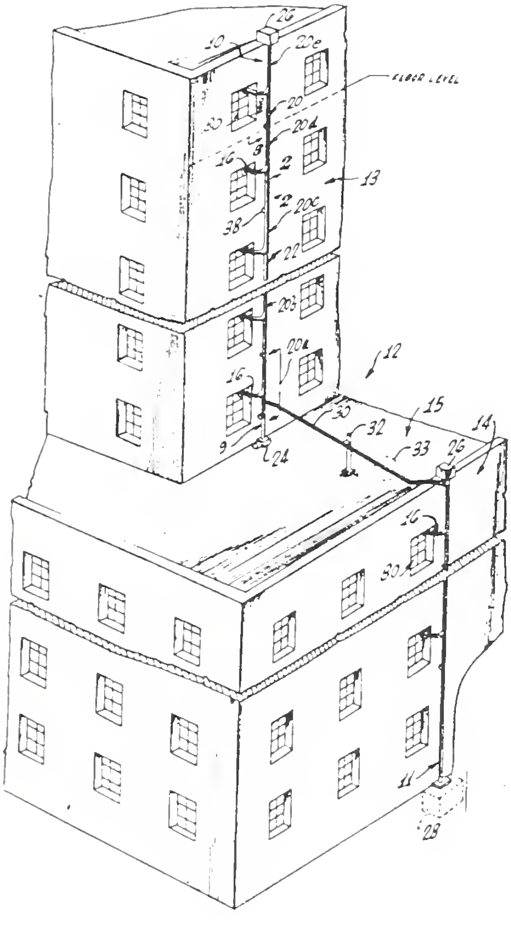


252. Smith MF, Jr and Sher J

EMERGENCY ESCAPE MECHANISM

US Patent No. 3,944,021; Cl 182/3, (B66B 9/00), Appl 18 Feb 1975, Discl. 16 Mar 1976, Assignee: Melvin F Smith, Jr, Jay Sher, Herbert Brown, Los Angeles, CA

The invention is directed to a novel fire escape system designed for use with multi-story buildings. The system comprises a generally cylindrical (or other suitable geometric shape) vertical column, preferably attached vertically adjacent to the outside of the building, which is longitudinally slotted on one side to form a main descent channel and which has mounted within it a series of helical lead screws which are fitted together to form one continuous worm shaft. A carrier seat (or harness) unit, which comprises, in part, a seat unit in the form of a net, a hook-up unit in the form of a ball or other suitable geometric shape, is adapted to readily engage within, and descend, at a controlled rate, in the above-mentioned apparatus. People responding to a fire alarm will step through the leg opening in the seat unit and then place the hook-up unit of the carrier seat (or harness) unit, into the slotted channel of a feeder tube (exit lead unit) which extends from an area inside the window to the main descent channel adjacent the window. The carrier seat unit, while carrying the person by means of the net, is then designed to slide, by gravity, through the feed tube and to the main column. The carrier unit then indexes in the main descent channel within the column and descends along the shoulders of the motor-driven rotating helical screw until it nears the bottom of the slot, at which time appropriate means are provided for disembarkation. The orderly means of escape described above can be accomplished without the use of existing stairs or elevators. 17 claims, 16 drawing figs. (Author)

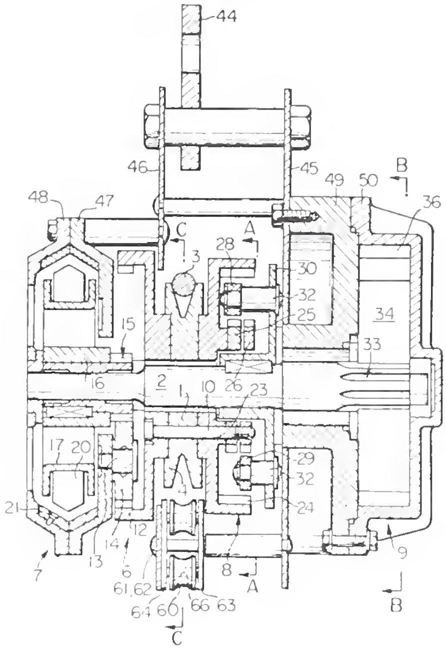


253. Tsuda M

SLOW DESCENDER INCLUDING FLUID AND MECHANICAL BRAKING DEVICE

US Patent No. 3,946,989; Cl 254/157, (B66D 5/04), Appl 17 Dec 1974, Discl. 30 Mar 1976, Priority: Japan, Appl No. 48-15150, 8 Feb 1973

A slow descender includes a rope pulley and a braking apparatus which restricts the rotation speed of the rope pulley. The braking apparatus includes a mechanical braking device containing a centrifugal brake which has centrifugal weights, a V-shaped lining part cooperating with the weights, and a speed-multiplying gearing device connecting the rope pulley and the centrifugal friction brake. The slow descender further includes an oil hydraulic braking device of the vane pump type or of the inscribed gear pump type. 6 claims, 21 drawing figs. (Author)



d. EXTINGUISHING AGENTS, ADDITIVES, AND EQUIPMENT

254. Anon

FIRE-FIGHTING FOAMS AND FOAM SYSTEMS

NFPA, Boston, MA; 140 pages, 1977

This book represents a compilation of 23 articles previously published in *Fire Journal*, *Fire Command* and *Fire Technology* from 1969 through May, 1976. The articles are arranged in four parts under the headings: Foams – Their Properties, Uses, Advantages, and Disadvantages; Effects on Foam of Water, Temperature, and Other Elements; Fires Fought with Foam; and Other Aspects of Foams.

255. Kung H-C [*Factory Mutual Res Corp, Norwood, MA*]

COOLING OF ROOM FIRES BY SPRINKLER SPRAY

ASME Trans. Ser C. J Heat Transfer; 99(3):353-359, 1977

5. FIRE PROTECTION OF STRUCTURES

d. Extinguishing Agents, Additives, and Equipment—Continued

Cooling of combustion products and the room by vaporizing water droplets appears to be a promising mechanism in sprinkler control of residential fires. An experimental procedure coupled with an energy balance scheme has been developed to obtain the heat absorption rate of a sprinkler spray. A test room was constructed, 3.05 x 3.66 x 2.45 m high, with a window. Hexane pool fires were selected to simulate room fires. The key parameters of investigation were water-discharge rate and drop size. For the room tested, a correlation has been established between the heat-absorption rate by the sprinkler water and the relative median drop size of the sprinkler spray. It is found that the rate of sprinkler water evaporated is directly proportional to the heat release rate and the water discharge rate, and varies as the minus 0.73 power of the relative median drop size. An extinction criterion for the hexane pool fire in the enclosure, based on the water evaporation rate at the time of sprinkler operation, has also been established. 6 figs, 4 tables, 15 refs. (Author)

256. Anon
HALON FIRE EXTINGUISHMENT
Berufsgenoss; (4):162, 1977 (German)

Halons (halogenated hydrocarbons of the methane series) exhibit great advantages over other extinguishants in many cases, but their toxic properties prohibit their unrestricted use. The "Fire Protection" Working Group of the Employer's Liability Insurance therefore recommends certain conditions relating to maximum halon concentration, a specific warning period, and a maximum evacuation time for fixed halon extinguishing systems in enclosures. Objections are raised as to the use of portable halon extinguishers in enclosed areas. (Fachdok 13/0717)

257. Maeschker E
EQUIPPING INSTALLATIONS AND PREMISES WITH FIRE-EXTINGUISHING SYSTEMS
Elek-Prakt; 30(10):321-322, 1976 (German)

The contradictions existing in requirements for fire-extinguishing systems that have been stipulated by various standards literature for industrial occupancies in the GDR are pointed out. For example, the number of hand-operated fire extinguishers required for 30-KV distributor stations of the power grid covering an area of 450 m² fluctuates from 2 to 5, depending on the regulations that are used. For facilities of the electrical power industry it is recommended that the recently revised trial regulations of the Dresden Electrical Power Institute be used. 6 refs. (RZh)

258. Zamyslov DA
COMPOUND 3.5 NOT SUITABLE FOR FIRE EXTINGUISHING IN CABLE ENCLOSURES
Energetik; (11):20-21, 1976 (Russian)

The reasons why the Energy Ministry of the USSR has decided to terminate the use of the "3.5 compound" (70% ethyl bromide and 30% CO_2) for fire extinguishing in cable enclosures are explained. The main reasons are the high toxicity of the ethyl bromide and the high cost of the installations. It is concluded that systems with the 3.5 compound must be replaced with water spray systems. (RZh)

259. LeBotlan Y
COMBINED POWDER AND FOAM EXTINGUISHMENT
Face au Risque; (128):55-56, 1976 (French)

Several tests carried out with a medium-expansion protein emulsion and a standard powder are described in this article. The fire chamber, the design of the tests with their various conditions, and the test objects are outlined. The values obtained from the tests are plotted on two curves. Further tests are required to reach conclusive results. 3 figs. (Fachdok 13/0701)

260. Parsons PL
TRIALS OF FOAM ON PETROL FIRES
Fire Eng J; 37(105):10-15, 1977

A series of foam tests was carried out at the Fire Service Technical College (UK) in November 1974 on pool fires of 84 m² area using 1,370 liters of gasoline and a foam solution application rate of 2.73 ℓ/m² /min. It was found that: 1) protein foam failed to extinguish the fire before the fuel was exhausted; 2)fluoroprotein, fluorochemical and synthetic foam all gave convincing control and extinction; 3) fluoroprotein foam had much superior burn-back performance; and 4) synthetic foam used at high expansion (700) gave very good control and extinction times. It is recommended that protein foam be replaced by a more effective low-expansion foam, medium-expansion foam for gasoline fires should be investigated, and tactical trials of all types of foam should be extended to cover gasoline fires with larger pre-burn times, to other fuels, and to a variety of special situations, including fires involving obstructions or difficulties of access. 2 figs, 14 refs.

261. Muetzelburg W [*Berlin-Tegel Airport, FRG*]
SUGGESTED NEW EXTINGUISHANT FOR AIRCRAFT CRASH FIRES
Fire Internat; 5(54):101-104, 1976 (English, French, German; Spanish Summary)

A new extinguishant designed for application on aircraft fuel fires from a height by rocket-propelled or missile extinguishers has been tested in experiments in which the agent was applied with four C-nozzles or via a channel leading into a circular test tank. The agent consists of 17.5 or 18.5 wt % of trichlorotrifluoroethane, 1.5 or 2.6 wt % dichlorotetrafluoroethane, 4.0 wt % AFFF, and 76.0 wt % water. The heat of the fire is necessary for the foam to develop. The experimental results are compiled in a table. (This article is an abridged version of a paper presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.) 1 table.

262. Anon
NEW TYPE OF BRANCHPIPE
Fire Internat; 5(54):108-109, 1976 (English, French, German; Spanish Summary)

The Hoenig all-purpose low-expansion foam/water playpipe model SU14 is described. It was specially designed for the rescue of personnel from military aircraft, but should be effective in other applications. The new playpipe gives a continuously variable choice of a close-range wide-foam jet, long-range solid-foam jet, water spray, and solid water jet. Technical data and a photograph of the new playpipe are given. 1 fig.

5. FIRE PROTECTION OF STRUCTURES

d. Extinguishing Agents, Additives, and Equipment—Continued

263. Anon
DEVELOPMENTS IN AUTOMATIC SPRINKLER INSTALLATIONS
Fire Prot Rev; 40(440):10-12, 1977

The technical features editor of *Fire Protection Review* surveys some developments in the design of automatic sprinkler installations with particular reference to the fire protection problems associated with high-risk storage. It is pointed out that all installations complying with the Fire Offices' Committee (UK) rules, which are cited, will extinguish a fire or, at least, contain it until extinguishing action is initiated. In some cases an installation has to be designed to meet a special operational requirement, eg, how to minimize water damages on premises where a gaseous system is not feasible.

264. Kravontka SJ [*City of New York, Board of Education*]
FIRE DELUGE SYSTEMS FOR SCHOOL THEATRICAL STAGES
Fire Technol; 13(1):53-58, 1977

With the adaptation of school theatrical stages for use in motion picture and television production, the increase in stage lighting necessitates improved ventilation because the increased heat dissipation may activate fire protection signaling devices. Theatrical stage design in schools should include an option for sealing a stage fire with an asbestos curtain or a fire deluge sprinkler system with drainage facilities. The use of a curtain inhibits the passage of personnel into the auditorium during a stage fire; a deluge water curtain does not. 3 figs, 5 refs. (NFPA)

265. Nicolson PC and Artman DO [*CIBA-GEIGY Corp*]
A TECHNIQUE FOR THE EVALUATION OF AFFF SEALING CHARACTERISTICS
Fire Technol; 13(1):13-20, 1977

A laboratory-scale screening apparatus has been developed to distinguish between aqueous film forming liquid formulations that would and would not form a seal on a suitable hydrocarbon liquid having an infrared spectrum in the gas phase. Information about the speed of film formation, quality of seal, and durability of seal can be obtained from a single experiment in less than 3 min. Fuel vapor content of a swept atmosphere is monitored continuously by its infrared absorption intensity at a specific wavelength using an infrared cell. Trends in seal speed reflect trends in control and extinguishment time, based on fire test data. 4 figs, 1 table, 3 refs. (NFPA)

266. Anon
AUTOMATIC FIRE EXTINGUISHING SYSTEM
Krafthand; 49(19):1153, 1976 (German)

Short circuits in the electrical wiring are the most frequent cause of fires in the motor compartments of cars, buses, etc. The Bavaria Feuerloeschapparatebau (Nuernberg, FRG) has developed a device for automatic fire suppression in which the sensor is a thermostat. The operating principle is pneumohydraulic. The actuating temperature can be regulated stepwise from 40 to 90°C. When the fire extinguisher, which is located at the most probable point of fire outbreak, is actuated, an acoustic and visual alarm device located on the instrument panel is also actuated. The device works independently of the vehicle's electrical network. Carbon dioxide powder, as well as halon extinguishants, can be used. (RZh)

267. Anon
FIRE SYSTEM QUELLS DANGEROUS DIP COAT BLAZE
Mod Paint Coatings; 66(4):40, 1976

The features and operation of a carbon dioxide fire extinguishing system that emits clouds of carbon dioxide gas from a battery of nozzles to down fires within seconds of outbreak are described. The system was custom-built to protect a volatile dip-coating machine. 1 fig.

268. Kato K, Hatakeyama T, Asano Y and Murakami N
DEVELOPMENT OF A SPRINKLER SYSTEM FOR DWELLINGS
Fire Sci Lab Japan. Rep; (13):34-38, 1976 (Japanese)

The design, operation and principal tactical and technical parameters of several fire-extinguishing systems of the sprinkler type that have been developed in Japan in recent years are described. The process of perfection and increase in the number of functions of such systems is outlined in chronological order. The comparative effectiveness of the use of these sprinklers in different fire situations is evaluated. Predictions are made as to the main trends in the further development and perfection of residential sprinkler systems. 3 figs, 3 tables. (RZh)

269. Kawa S and Horinoguti M
DEVELOPMENT OF EXTINGUISHING AGENTS. PRECIPITATION BASE. PART 2
Fire Sci Lab Japan. Rep; (13):29-33, 1976 (Japanese)

The physico-chemical composition of nine new fire extinguishing agents developed by the Fire Engineering and Fire Methods Research Institute (Tokyo) in 1974-1975 is analyzed and the test results are given. All the new agents belong to the alkali-acid group of compounds, and therefore their range of application is almost unlimited. The design and operation of the laboratory test stand, which permits distinct comparison of the effectiveness of these agents, are described. A description and the results of tests of the new agents under real conditions of suppression of a fire in a large construction project from a helicopter especially equipped for fire extinguishment are presented. The high level of effectiveness of these agents is illustrated by the fact that the fire-extinguishing foam was applied to a sector lying in the path of the fire-spread front and, when the fire approached, its front was disrupted despite the fact that the foam was applied 40 min before the fire front reached this sector. This fact was also confirmed by laboratory tests, indicating that the extinguishing agents are capable of retaining their properties for a long time after they are applied to the surface being protected from fire. 6 figs, 4 tables. (RZh)

270. Kojima M, Torii S, Matsuhashi S and Kumazawa M
STUDY OF THE THICKENING OF WATER. PART 3
Fire Sci Lab Japan. Rep; (13):122-126, 1976 (Japanese)

Some of the physico-chemical and technological aspects of the process of water thickening are analyzed. It is pointed out the thickened water is a highly effective and sufficiently cheap extinguishing agent. The results of fire tests of several new extinguishing agents (solutions of potassium and sodium alkalis in water with the addition of 0.2% thickener) are presented. The effectiveness of the new extinguishing agents, compared to ordinary water, in extinguishing simulated fire centers of identical characteristics was assessed during tests using pumps of varying pressure and hoses of different diameter. Evaluated in particular was the area blanketed with water at varying spray intensities. It is shown that an extinguishing solution with a thickening agent, owing to its greater viscosity, is characterized by much lower spraying coefficient, making it possible to get an increase of about 25% in the surface area effectively blanketed, all other conditions being equal. Also pointed out are other improved hydrodynamic qualities of thickened water. In particular, a stream of thickened water is subjected to less side wind shear than plain water, which is also a result of the greater viscosity. Some recommendations for optimizing the techniques of production and transportation of thickened water are given. (RZh)

271. Anon

AUTOMATIC FIRE EXTINGUISHING INSTALLATIONS

Rev Tech Feu; 17(160):26-34, 39, 1976 (French)

The main design and operating principles of automatic water-spray, CO_2, foam, and powder fire extinguishing systems, and also systems in which dichlorofluorobromomethane and trifluorobromomethane are used are described. The advantages of all these types of systems are noted and recommendations are made as to their use. The fire protection system of the modern George Pompidou Cultural Center building (France) is described. Depending on the purpose of the various building areas and the features of their fire hazard, different automatic fire-extinguishing systems, interior fire hydrants, fire extinguishers, and automatic fire detection systems are being used. Also described is the fire safety of three aircraft hangars. 9 figs. (RZh)

272. Anon

"PYROFORANE 1301" FIRE PROTECTION ON SHIPS

Schiff Hafen; 28(10):999, 1976

The new ship fire extinguishant, "Pyroforane Halon 1301" (bromotrifluoromethane) is colorless, electrically non-conductive, is inert for most materials (except plastics based on cellulose), and is not toxic. It is recommended primarily for automatic fire extinguishing installations and is especially suited for use in closed spaces. The Pyroforane 1301 fire extinguishing system should be able to flood the protected space in less than 10 seconds. Even at the low concentration of 5-7%, Pyroforane 1301 is effective. At this concentration the O_2 content in the air drops only 1%, so that evacuation of personnel is not required.

273. Averill CF [*Grinnell Fire Prot Systs, Providence, RI*]

SPRINKLER SYSTEM DESIGN: PAST, PRESENT, FUTURE

Specifying Engr; 37(6):100-102, 1977

The history of the development of sprinkler systems is reviewed, with particular emphasis on the basic applications of existing technology responsible for recent advances, namely, the application of computer techniques to system design and a change in thinking as to what the prime objective of a sprinkler system is, can be, or should be. The first advance relates primarily to the realm of hydraulic calculations, improving the efficiency of water use; the second advance relates to the so-called safety-to-life approach to sprinkler system design suitable for people-oriented occupancies. Some of the hardware satisfying this new mandate is described, such as the extended-coverage sidewall sprinkler and quick-response sprinkler actuators. Also treated is the development of the on-off sprinkler, which helps to reduce water damage. Prospects for future developments are outlined. 2 figs.

274. Ford CL [*EI duPont de Nemours and Co, Wilmington, DE*]

HALON 1301 UPDATE: RESEARCH, APPLICATION, NEW STANDARD

Specifying Engr; 37(6):104-107, 1977

Since the author's "Where and Why to Use Halon 1301 Systems" appeared in *Spec Engr* in January, 1972, several important developments have come about in the technology and application of Halon 1301 total-flooding fire extinguishing systems. Among these are a more rigorous method of calculating the flow properties of Halon 1301 in piping networks, standardized laboratory tests for obtaining flame extinguishing and inerting requirements for liquid and gaseous fuels, a practical approach to protection of Class A fire hazards, and expanded applications for Halon 1301 systems. There also has been field experience, both from discharge testing of systems and under actual fire situations. These developments are examined in this article and areas for future improvmenets in installations are suggested. 2 figs. (Author)

275. Meldrum DN [*Nat Foam Systs Inc, Lionville, PA*]

FIGHTING FIRE WITH FOAM: BASICS OF EFFECTIVE SYSTEMS

Specifying Engr; 37(6):78-85, 1977

The extinguishing mechanism of foam, foam characteristics, foam systems, proportioning methods, foam trucks, foam system types (portable, fixed, and semifixed), foam system design, and systems application to oil rig platforms, power stations, and aircraft hangars, are reviewed against the background of the rapid advances made in foam technology, incorporating knowledge of the chemistry of foam stabilizers, engineering of foam application devices, foam rheology, and fire-fighting foam system design. 4 figs, 5 refs.

276. Thummernicht W

FIRE EXTINGUISHING SYSTEMS. LARGE SYSTEMS FOR GAS AND OIL TANKS

TAB Tech Bau; (6):589-590, 1976 (German)

A classification of combustible substances is formulated and extinguishing methods for each class are indicated in accordance with this classification system. Since the foam extinguishing method is applicable for both kerosine and gasoline, the features of this method are briefly described. A detailed description and block diagram of a protection system for open gasoline and kerosine storage containers based on the foam-extinguishing method are given. This scheme was introduced into practice in the FRG in 1974. For a farm of three tanks, each 20 m in diameter, 16 m high, and with a capacity of 500,000 liters, and two other tanks, each 5 m in diameter, 10 m high, and with a capacity of 20,000 liters, the protection system includes an earthen bund (the height and base width of the main embankment are 2.4 and 6 m, resp, and of the intermediate embankment 2.4 and 3 m, resp), a water drenching and foam extinguishing system, including a water source with a water feeder, a container for the foam concentrate, a distribution network with shutoff and start-up fittings, nozzles, and a control assembly with monitoring and measuring apparatus. 1 fig.

277. Darlix GEC
DEVICE FOR THE FIRE PROTECTION OF BUILDINGS AS WELL AS FOR CLEANING THEIR FACADES OR WALLS
French Patent No. 2,270,402; Cl E04B 1/94, A62C 35/22, Appl 7 Apr 1974, Discl. 5 Dec 1975, Assignee: Author

A system is patented for the fire protection of buildings, especially highrise buildings, as well as for cleaning the glasswork and surfaces of facades. The device consists of a mains riser (or several risers) connected via a gate valve to the municipal water supply system, in the upper portion of a building, with a reserve water supply. On each floor water supply conduits are connected to the riser via a gate valve coupled with a fire detector. The water conduits are connected to horizontal distributer pipelines spanning each floor of the building. Diffusers aimed at points to be drenched with water are mounted on the distributor pipelines. The water pressure in each diffuser is kept constant by distributors on the pipelines. A similar system can also be used for the fire protection of stairwells. It has been found that at temperatures up to 1,200°C the glass areas continuously wetted by the diffusers did not exhibit cracks and deformations, because the layer of water adhering to the glass and gradually evaporating forms a vapor buffer which protects the glass. 12 claims, 6 drawing figs. (RZh)

278. Paravinja S
INSTANTANEOUSLY OPENING AUTOMATIC PLUG FOR THE RELEASE OF A PRESSURIZED FLUID
French Patent No. 2,280,007; Cl F16K 17/38, A62C 37/26, Appl 25 Apr 1974, Discl. 20 Feb 1976, Assignee: S.A. de Fabrication de Genlis, France

A patent is disclosed for an instantaneously opening automatic plug for the release of a pressurized fluid circulating in a pipe network or in a container, consisting of a hermetic valve, a fluid outlet, eg, the nozzle of a fire extinguishing system, releasable means to keep the valve closed, mounted on a support which is part of the piping system or container and is equipped with a component sensitive to a certain parameter, eg, the ambient temperature, to prevent these means from releasing under normal conditions. 4 drawing figs.

279. Aufischer P
ROCKET WITH FIRE EXTINGUISHANT
FRG Patent No. 2,148,319; Cl A62C 19/00, Appl 28 Sep 1971, Discl. 19 Aug 1976, Assignee: Homewell GmbH, FRG

The invention relates to a retrievable rocket containing a fire extinguishant to be released over a burning object (eg, aircraft). The rocket consists of a booster section and a destructible payload capsule. The shell of the capsule consists of parallel sections with lower end hinge-attached to the booster and forward end held together by a ring which can be sprung by means of a time-of-flight detonator. The shell sections, once deployed, are held fixed in an oblique or cambered position by a click-stop device to allow auto-rotating descent of the booster section for recovery and minimization of possible injury to persons or damage to buildings. 3 claims, 2 drawing figs.

280. Emmrich F, Schweinfurth E, Wetterich W and Bader O
METHOD OF FLUSHING THE PIPING SYSTEM OF A LOW-PRESSURE CARBON DIOXIDE FIRE-EXTINGUISHING SYSTEM AFTER USE
FRG Patent No. 1,708,100; Cl A62C 35/40, Appl 24 Feb 1967, Discl. 8 Jan 1976, Assignee: Total Foerster u. Co, FRG

The patent relates to a method of emptying or flushing the piping system of a low-pressure carbon-dioxide fire extinguisher or system after use in order to prevent plugging of the system by solidification of the carbon dioxide. For this purpose a pressurized gas is passed through the system, the gas being supplied either by the gas phase of the carbon dioxide extinguishant or by an independent gas, released either through the existing system or through a supplementary piping system with valve and a pressurized gas source. 9 claims, 2 drawing figs.

281. Rossmy G and Koerner G
USE OF SURFACE-ACTIVE ORGANOSILICON AGENTS FOR FIRE EXTINGUISHMENT
FRG Patent No. 1,802,052; Cl A62D 1/00, Appl 9 Oct 1968, Discl. 25 Mar 1976, Assignee: Th Goldschmidt AG, Essen, FRG

A patent is disclosed for use as a fire extinguishant of organosilicon surfactants mixed with water or of an organic liquid of the surfactants mixed with water to form a foam concentrate. These surfactants are effective for extinguishing fires of flammable polar liquids (eg, alcohols) and, in combination with chemical powder extinguishants, form a highly effective foam even with seawater. The results of comparative tests of the foam-forming capability and extinguishing efficiency of solutions based on these surfactants and fluorohydrocarbons are given.

282. Kretzschmar A and Reichel H
METHOD OF PRODUCING POWDER EXTINGUISHANTS
GDR Patent No. 117,988; Cl A62D 1/00, Appl 5 Mar 1975, Discl. 12 Feb 1976, Assignee: Authors

A method is disclosed for the production of powder extinguishants based on alkali or ammonium salts and urea in which the starting materials are melted in some known manner until adequately mixed and/or reacted and the melts are immediately pulverized under prescribed conditions so as to yield an extinguishant powder with particle diameter of 0.1 to 500 microns and, if necessary, to simultaneously make the powder water-repellant by adding a suitable material. 3 claims, no drawing figs.

283. Furusho T

FIRE EXTINGUISHER WITH VARIABLE INTERNAL PRESSURE

Japanese Patent No. 51-17000; Cl 95 B 260, (A62C 3/00), Appl 11 Nov 1970, Discl. 29 May 1976, Assignee: Tyuo Kiki Seisakusho KK, Japan

A patent is disclosed for the design and operating principle of a portable fire extinguisher which can be used repeatedly. It is designed for the use of a special reagent which spontaneously increases the internal working pressure in the extinguisher while it is stored. When the extinguisher is charged, the fire extinguishant is introduced into the lower tank, as is the required amount of a reagent which within a relatively short period of time (several hours) spontaneously increases the internal pressure. The extinguisher design calls for a safety valve, which relieves the excess pressure when it exceeds a certain predetermined threshold value. It is emphasized that the design charge of reagent determines the level of the steady-state internal pressure several hours after the extinguisher is filled, but the relief valve is necessary for safety reasons in case the maintenance personnel have erred while filling the extinguisher with the design charge of reagent. The extinguisher is provided with a manometer. The physical and chemical composition of the reagent is not disclosed. 4 drawing figs. (RZh)

284. Kobayashi T and Tashe S

AUTOMATIC DEVICE FOR EXTINGUISHING CABLE FIRES IN MANHOLES

Japanese Patent No. 51-22758; Cl 95 B 260.3, (A62C 37/02), Appl 27 Apr 1971, Discl. 12 Jul 1976, Assignee: Showa Densen Denran KK, Japan

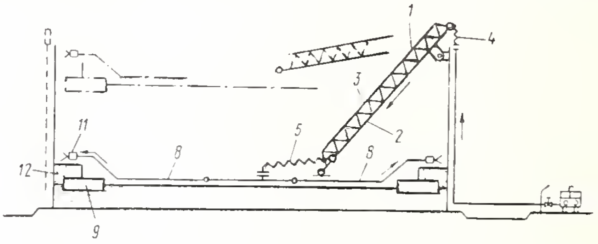
The patent discloses the design, diagram and operating principle for an automatic fire extinguisher designed for use in manholes of underground municipal electrical and pipeline distribution systems. The extinguisher consists of the following principal components: compressed-air cylinder; two cylinders with the fire-extinguishant components; proportioners; a set of sprinkler heads; several electrical fire detectors; d-c electrical power relay; d-c voltage source (rectifier connected via relay terminals to an a-c current network); and an electromechanical actuator for automatic opening of the compressed-air cylinder. In the case of fire, the detectors register the increased temperature in the protected area, the relay terminals are opened, and the electromechanical actuator is connected to the power network. The actuator ensures the supply of compressed air into the cylinders containing the fire-extinguishant components and to the proportioner. 1 drawing fig. (RZh)

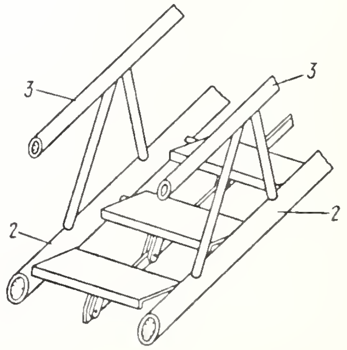
285. Okamoto T

DEVICE FOR EXTINGUISHING FIRES IN OIL TANKS WITH FLOATING ROOFS

Japanese Patent No. 51-4524; Cl 64 G 21, (B65D 87/32), Appl 29 Jan 1972, Discl. 12 Feb 1976, Assignee: Nippon Kako Kikai KK, Japan

This invention relates to the design and operating principle of equipment for tanks for the storing of highly flammable petroleum products which are equipped with a floating roof and an extinguishant delivery system. A circular steel roof floats freely on the surface of the product being stored in the tank. So that the roof can displace freely, there is a 100-mm gap between the roof and the tank walls. This gap is bridged by a special closure fixed along the edge of the floating roof. The closure consists of hinged-arm systems and mechanisms to ensure a tight fit and protection against atmospheric precipitates. The lowest position of the floating roof is governed by a bracket located at a height of 1.5 m from the bottom of the reservoir. The design also provides for a movable ladder, the top of which is hinged to the upper edge of the tank, while the bottom can be moved freely over the surface of the floating roof on rollers. One of the features of the patented design is that the handrails and the longitudinal load-bearing components of the ladder are made of steel tubing through which a fire-extinguishing solution can be supplied from a fixed fire-extinguishing system to the surface of the burning petroleum product inside the tank in case of fire. The solution is fed through pipe connections fixed to the outside of the tank and through a section of flexible hose into the above-mentioned ladder tubes. The ends of the ladder tubes are joined by means of flexible pipe connections to radial pipes laid on the surface of the floating roof through which the fire-extinguishing solution is applied to the surface of the burning petroleum product. The patented structure is shown in Figs 1, 2, where 1 is the movable ladder, 2 are the longitudinal tubular load-bearing components of the ladder, 3 are the tubular handrails, 4 and 5 are the flexible pipe connections which deliver the fire-extinguishing solution, 8 is the floating tank roof, 9 and 12 are the gap-bridging components of the floating roof, and 11 are the sprinkler heads through which the fire-extinguish-





ing solution from the radial pipes is applied to the inner surface of the tank walls and thus to the surface of the burning petroleum product, flowing downward along the walls through special distributors. The dash-dot line shows the upper working level of the floating roof. 3 drawing figs. (RZh)

286. Taai K

INTERCHANGEABLE FIRE EXTINGUISHER WITH FIXED HOLDER

Japanese Patent No. 51-20836; Cl 95 B 260.3, (A62C 35/00), Appl 31 Mar 1971, Discl. 28 Jun 1976, Assignee: Marunaka KK, Yamato Shokaki KK, Japan

A patent is disclosed for the design and operating principle of a fire-extinguishing system consisting of a fixed holder (attached to the wall, floor, or a special bracket) and an interchangeable cylinder with a fire-extinguishing solution installed in the holder and held there by means of spring-driven locks. The holder contains an electromechanical actuator with a lever for automatic opening of the hermetically sealed cylinder in case of fire. The holder is located in the immediate vicinity of a fire-hazardous object in such a way that the discharge orifice of the cylinder is aimed at the object or at some specific point on the object. It is pointed out that this design is more effective than the traditional self-contained extinguishers since the requirements of compactness are less rigid, making this extinguisher more reliable. In addition, this design, which provides for the interchange of cylinders with different extinguishants, ensures a considerable reduction in expenditure of materials and labor in production. It is proposed that the valve-lever devices be actuated by extrinsic control signals. 3 drawing figs. (RZh)

287. Takoya K

FIRE EXTINGUISHING DEVICE

Japanese Patent No. 51-28960; Cl 95 B 262, (A62C 35/00), Appl 5 Feb 1970, Discl. 23 Aug 1976, Assignee: Tsurukame Onsuiki Kogyo KK, Japan

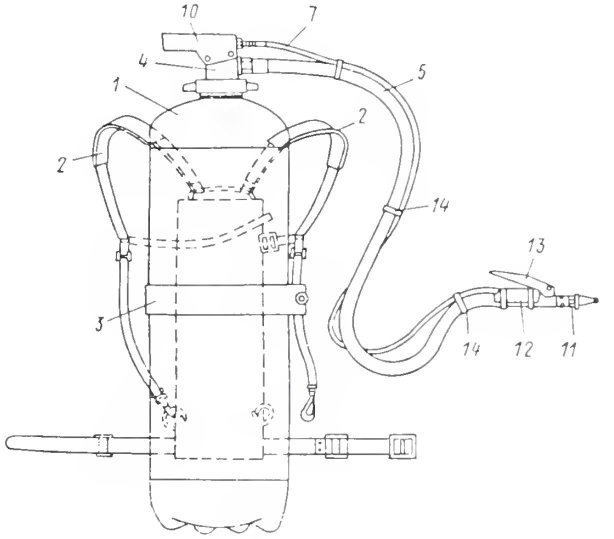
A patent is disclosed for the design and operating principle of an automatic system for extinguishing fires in the furnace rooms of public baths. It is pointed out that solid-fuel boilers and fixed boilers used for heating water that are operated with a composite fuel (diesel and solid) are increased fire-hazard sources in the case of high humidity and, therefore, increased thermal conductivity, conditions which exist in relatively large public baths and bathing facilities. The system includes a set of fusible safety locks, which act as thermal fire detectors, and an electric pump. Voltage is supplied to an electric motor via terminals of a relay that is actuated when the fusible locks melt. In addition, the system contains a proportioner for automatic mixing of the powder agent and water, as well as a fire hose with a nozzle that can either be operated manually or can be fixed in a special holder and aimed at the furnace chamber of the boiler. 1 drawing fig. (RZh)

288. Tsurumi T

BACK-PACK FIRE EXTINGUISHER

Japanese Patent No. 51-10040; Cl 95 B 25, (A62C 23/00), Appl 18 May 1970, Discl. 1 Apr 1976, Assignee: Tyuo Kiki Seisakusho KK, Japan

The patent relates to the design and operating principle of a backpack fire extinguisher having a system of adjustable straps and a short hose with a control lever at the metal end of the hose. The lever is spring-actuated and is connected to the output valve on the top of the extinguisher by means of a flexible metal trigger cable that extends along the hose and is fastened to it by several clips. The cable acts as a mechanical trigger and, in combination with the control lever, makes it possible to turn the extinguisher on and off. The design is illustrated in the figure, where 1 is the housing of the extinguisher, 2 are shoulder straps, 5 is the hose, 7 is the trigger cable, 12, 13 are the control lever components, and 10 is the cover of the discharge valve. 4 drawing figs. (RZh)



289. Ashworth DH

IMPROVEMENTS IN OR RELATING TO FIREFIGHTING EQUIPMENT

UK Patent No. 1,440,990; Cl A5A 12, (A62C 35/00), Appl 14 Dec 1973, Discl. 30 Jun 1976, Assignee: Simon Eng Co Ltd, Dudley, UK

This invention relates to fire-fighting equipment for use in environments of the kind where mains carrying a fire-fighting medium are susceptible to damage, by explosion, for example, such as on board large ships, particularly, though not exclusively, on board very large crude carriers. Equipment is provided for fighting a fire on or in the region of a structure, comprising at least one unit which is fixedly mounted on said structure with a fire-fighting monitor, a support for the monitor, and tank or tanks for storing a fire-fighting medium adjacent to the monitor, a pump for pumping the contents from tank or tanks to the monitor, a motor for driving the pump, a fuel supply located on the unit for the monitor and means responsive to a radiated signal from a remote position for starting the motor. 2 drawing figs.

5. FIRE PROTECTION OF STRUCTURES

d. Extinguishing Agents, Additives, and Equipment—Continued

290. Howard RD

FIRE-FIGHTING FOAM COMPOSITIONS AND METHOD OF FIRE-FIGHTING

UK Patent No. 1,435,200; Cl A5A 1, (A62D 1/00), Appl 21 Jun 1973, Discl. 12 May 1976, Assignee: Imperial Chemical Industries Ltd

The fire-fighting foam is produced from a foaming agent containing the following components: surfactants sold under the trade names Perlankrol TM, Empigin OB, Empicol OB, Monoxol OT, Empicol EMB, Arylan S90 and Nansa TS60. Especially preferred is the surfactant Empicol TCR. The thickening agent to lend thixotropic properties to the foam, eg, a copolymer of acrylic acid and ethyl acrylate, may be Visalex HV30. In order to increase the effectiveness, a surfactant based on carbon fluoride containing a hydrophilic group and an aliphatic perfluorocarbon group with not less than three carbon atoms is introduced into the composition. An antifreeze, ethylene glycol monabutyl ester, is also introduced into the composition. The recommended content (ℓ/100 ml) in the concentrate is: 1-50 foaming agent; 0.2-50 thickener; 0.2-25 fluorine derivatives; and 5-25 antifreeze. The recommended content in the active solution is: 0.05-2 foaming agent; 0.01-2 thickener; 0.01-1 fluorine derivatives; and 0.2-2 antifreeze. 15 claims.

291. Schmidt VG

FIRE EXTINGUISHER BLANKET

UK Patent No. 1,444,750; Cl A5A, (A62C 7/00), Appl 31 Oct 1973, Discl. 4 Aug 1976, Assignee: Author

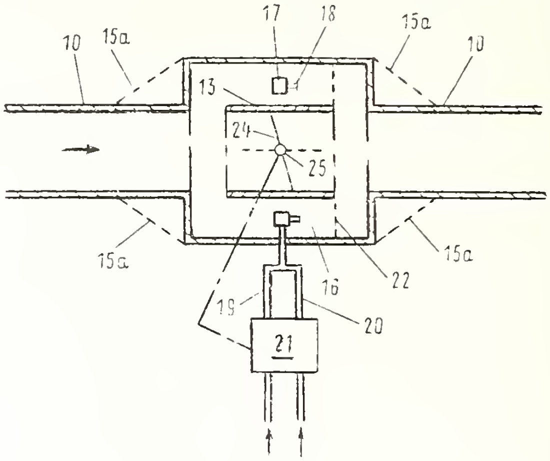
A patent is disclosed for a fire extinguisher blanket to extinguish small fires in enclosures, cars, motorboats, etc. The blanket comprises a sheet of fire-resistant material, a sheet of heat-rupturable material, (eg, a polyethylene film) attached to at least one side of the fire-resistant material to form at least one enclosure, the enclosure containing a fire-extinguishing material (eg, bicarbonate of sodium). Additional enclosures can be formed above and below the fire-resistant materials and the heat-rupturable material for additional effectiveness. The blanket is rolled up and stored near a point of potential fire hazard. In case of fire, the blanket is unrolled and placed over the fire; the lower layer melts, releasing the powder onto the fire. 12 claims, no drawing figs.

292. Wilson SG

FOAM APPARATUS

UK Patent No. 1,430,203; Cl B1C, (B01F 3/04, A62C 5/06), Appl 15 Sep 1973, Discl. 31 Mar 1976, Assignee: John Kerr and Co, Ltd, Manchester, UK

This invention relates to appliances and apparatus for use in producing foam. According to the invention, a device for conducting a flow of gas with or without foam generation comprises first means defining an inner duct, second means defining an outer duct surrounding the inner duct, a valve for controlling flow of gas through the inner duct and arranged to be open, or partly or fully closed, so as when partly or fully closed to direct gas flow to the outer duct means whereby liquid and foam compound may be supplied to the interior of the outer duct in spray form, a reticular member across the outer duct on which the spray impinges, and means for controlling the supply of liquid and foam compound, said valve and said supply control means being operatively connected so as to be adjustable together. 7 claims, 1 drawing fig. (Author)

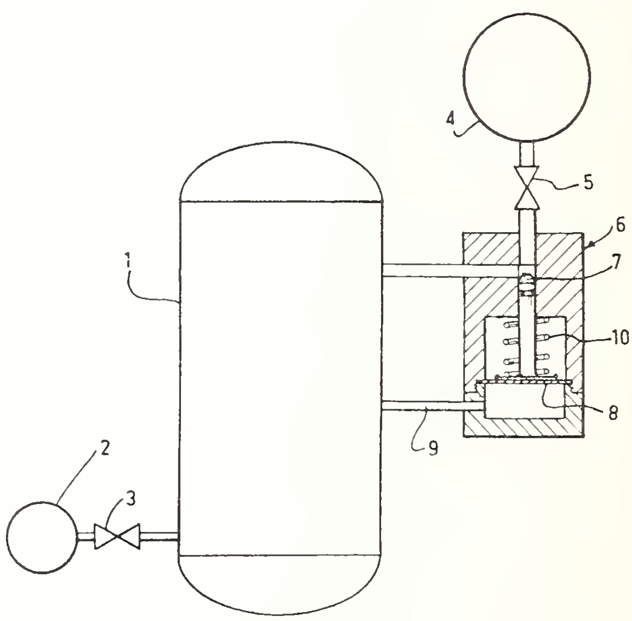


293. Biro GD

METHOD AND APPARATUS FOR PRESSURIZING RESERVOIRS OF FIRE-FIGHTING EQUIPMENT

US Patent No. 3,937,257; Cl 141/3, (B65B 1/04), Appl 13 Dec 1974, Discl. 10 Feb 1976, Assignee: Biro Fils, Paris, France

A patent is disclosed for a method and apparatus for pressurizing a reservoir comprising directly introducing gas



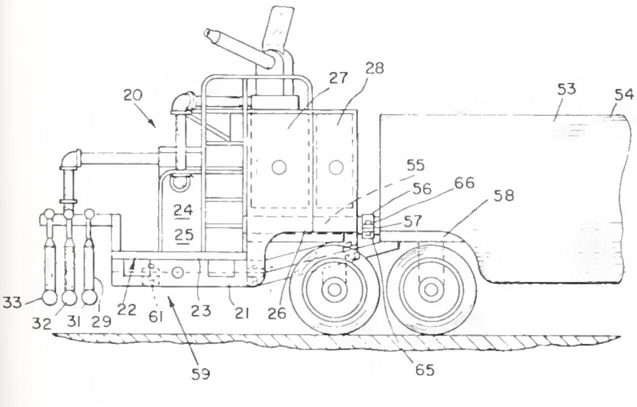
into the reservoir from a first supply source in an amount to instantly pressurize the reservoir and balancing the pressure between a second supply source for service gas and the reservoir via a regulating valve mechanism which controls admission of gas under pressure from the second source into the reservoir when a differential exists between the second pressure source and the pressure prevailing in the reservoir due to its connection with the first pressure source. 4 claims, 1 drawing fig. (Author)

294. Filter HE
FIRE EXTINGUISHING COMPOSITION
US Patent No. 3,972,820; Cl 252/5, (A62C 1/00), Appl 20 Dec 1973, Discl. 3 Aug 1976, Assignee: The Dow Chem Co, Midland, MI

Disclosed is a novel fire extinguishing composition comprising a heat and gas producing pyrotechnic composition comprising a binder and an oxidizer, and having dispersed therein a halogen-containing fire extinguishing agent. The pyrotechnic, when ignited, thermally disseminates the fire extinguishing agent onto the fire. 12 claims, no drawing figs. (Author)

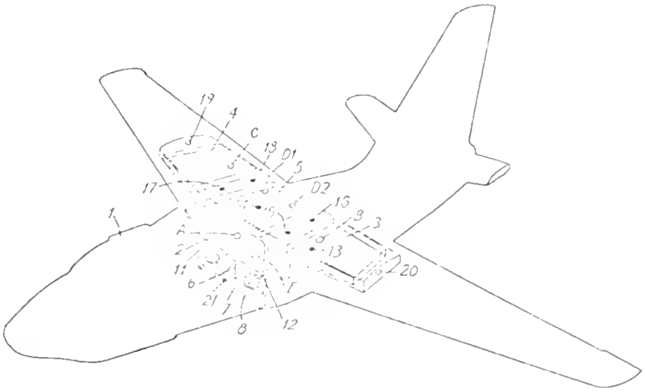
295. Gibson JC
FIRE-FIGHTING-FOAM PRODUCING MODULE
US Patent No. 4,037,664; Cl 169/15, (A62C 5/02), Appl 10 Nov 1975, Discl. 26 Jul 1977, Assignee: Gibson Motor and Machine Service, Inc, Lawrence, MA

A modular fire-fighting unit can be used on the ground as an individual fire piece connected to a water source such as a hydrant, for producing foam or as a nurse unit to other fire apparatus, or it can be quickly mounted on, or demounted from, a portable source of water such as a 5,000 gallon tank truck, for producing foam to extinguish runway fires. The module includes a protein tank, an AFFF tank, an inflexible connection to a source of water, mixing valves and a motor-driven pump so that foam may be dispersed from either a turret gun or an airport spreader bar. 6 claims, 5 drawing figs. (Author)



296. Heath RC and Wyeth HWG
FIRE PROTECTION MEANS
US Patent No. 3,986,560; Cl 169/61, (A62C 3/08), Appl 26 Sep 1974, Discl. 19 Oct 1976, Priority: UK, Appl No 45396/73, 27 Sep 1973, Assignee: Author

A fire protection apparatus, particularly for liquid fuel containers which are carried in aircraft or other vehicles, comprises a pressure transducer for producing an electrical output upon sensing a pressure change of predetermined magnitude in a liquid, a source of fire extinguishants, an actuator for discharging the fire extinguishant from the source of fire extinguishant, and a self-energized repeater adapted to respond to the output of the pressure transducer and to generate a signal for operating the actuator to discharge fire extinguishant from the source. 18 claims, 16 drawing figs. (Author)



297. Hefetz U
METHOD AND DEVICE FOR EXTINGUISHING FIRES IN OIL WELLS
US Patent No. 3,993,137; Cl 169/46, (A62C 1/22), Appl 27 May 1975, Discl. 23 Nov 1976, Priority: Israel, Appl No. 44936, 31 May 1974, Assignee: Author

A patent is disclosed for a method and apparatus for extinguishing fires in oil wells. The method includes the steps of: attaching a shell which is integral with required guides and valves to the outer oil producing pipe or its casing; inserting at least one positioning pin member through the outer pipe at a first level to immobilize the inner pipe relative to the outer pipe; and driving at least one drill at a second lower level through both pipes into a closed plug housing diametrically opposed thereto, so that part of the wall of the outer pipe remains in two diametrically opposed positions. The apparatus for carrying out this method includes an arcuate shell of at least two parts having an internal radius equal to the external radius of the outer oil producing pipe and adapted to be attached to the outer wall of the outer pipe; at least one housing containing a positioning pin attached to the shell at one level; and at least one drill guide together

5. FIRE PROTECTION OF STRUCTURES

d. Extinguishing Agents, Additives, and Equipment—Continued

with a drill attached to the shell at a level below the first level. 15 claims, 12 drawing figs. (Author)

298. Hopper LR
HIGH INTERNAL PHASE RATIO EMULSION FIRE EXTINGUISHING AGENT
US Patent No. 3,984,334; Cl 252/8.05, (A62D 1/09), Appl 28 Feb 1974, Discl. 5 Oct 1976, Assignee: Petrolite Corp, St Louis, MO

A thixotropic high internal phase ratio emulsion which is essentially nonflammable is employed as a fire extinguishing agent. In the preferred embodiment the emulsion contains an aqueous internal phase which makes up the major part of the emulsion, usually in excess of 90%, but preferably in excess of 95%, and a minor amount of an external phase which is of low volatility and/or flammability such as a heavy oil and an emulsifying material. Because it is thixotropic and cohesive, it forms a blanket over a fire, and coats adjacent surfaces, preventing the spread of the fire. This composition is particularly useful in fighting forest fires where the emulsion can be dropped or sprayed from aircraft with a minimum loss due to dispersion in air currents. 6 claims, no drawing figs. (Author)

299. Jederstrom GL
FOAM FORMING COMPOSITION
US Patent No. 3,997,467; Cl 252/305, (C09K 3/30), Appl 21 May 1974, Discl. 14 Dec 1976, Priority: Sweden, Appl No 15217/71, 26 Nov 1971, Assignee: Pharmica Aktiebolag, Uppsala, Sweden

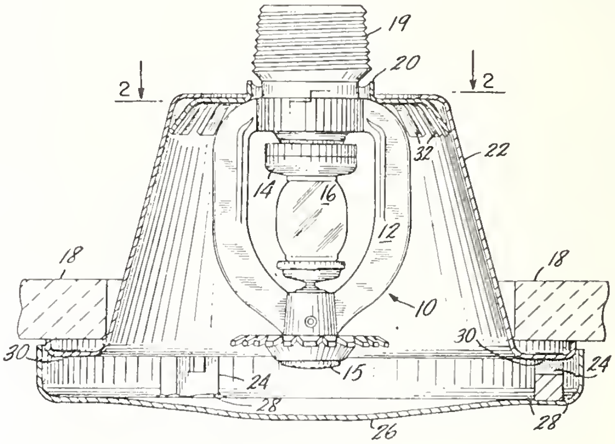
A patent is disclosed for a foam forming composition consisting of a mixture of a hydrocarbon and/or a lipophilic hydrocarbon derivative, water, a liquefied propellant and a surface active agent or mixture of such agents in such proportions as to obtain a mesomorphic phase, the surface active agent or agents being soluble in the water and the hydrocarbon and/or the lipophilic hydrocarbon derivative. 11 claims, no drawing figs. (Author)

300. Johnson WV
DELAYED CLOSING FIRE SPRINKLER HEADS
US Patent No. 3,991,829; Cl 169/19, (A62C 37/06), Appl 14 Oct 1975, Discl. 16 Nov 1976, Assignee: US Fire Control Corp, Oxford, MA

A patent is disclosed for a fire sprinkler valve with a valve member coupled to a primary temperature responsive control mechanism that is activated to open the valve in response to ambient temperatures above a given temperature level and that urges the valve toward closed position in response to temperatures below that level. An auxiliary control causes automatic reclosure of the valve only in response to a decrease in an ambient temperature to below the given level. 6 claims, 7 drawing figs. (Author)

301. Juliano RF
APPARATUS FOR USE WITH A FIRE SAFETY DEVICE
US Patent No. 3,998,273; Cl 169/37, (A62C 37/12), Appl 5 Mar 1976, Discl. 21 Dec 1976, Assignee: The Reliable Automatic Sprinkler Co, Inc, Mount Vernon, NY

An apparatus for use with a fire safety device such as a sprinkler has fusible means for attaching one or more magnets to a non-magnetic first member or escutcheon. The magnets may also hold the escutcheon to a magnetic second member such as a housing for the sprinkler until heat, as from a fire, melts the fusible material to release the escutcheon from the magnet. 15 claims, 3 drawing figs. (Author)



302. Keil JW
FOAM CONTROL COMPOSITION
US Patent No. 3,984,347; Cl 252/321, (B01D 19/04), Appl 19 Dec 1974, Discl. 5 Oct 1976, Assignee: Dow Corning Corp, Midland, MI

A composition for controlling foam is disclosed which comprises 1) a base oil of polyoxypropylene polymers, polyoxypropylene-polyoxyethylene copolymers or siloxane glycol copolymers; 2) a foam control agent comprising a liquid polydimethylsiloxane, silica, and optionally a siloxane resin; and 3) a siloxane copolymer dispersing agent. 10 claims, no drawing figs. (Author)

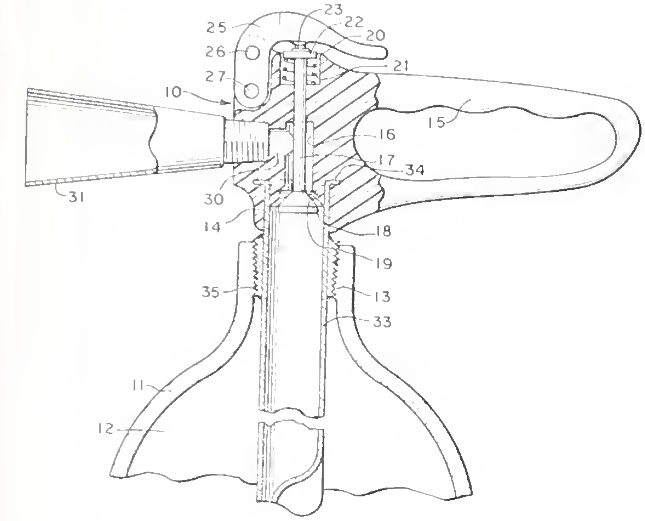
303. Liautand JP
FIRE EXTINGUISHER HEAD ASSEMBLY
US Patent No. 3,998,274; Cl 169/89, (A62C 13/00), Appl 15 May 1975, Discl. 21 Dec 1976

A head assembly for a portable fire extinguisher includes a plastic injection-molded body adapted to fit over the discharge opening of a pressurized cylinder of fire extinguishing agent. The body includes an internal passageway in which a valve is slidably mounted. An O-ring embedded in the wall of the passageway serves as a valve seat for the valve to provide control of the dispensing of the extinguishing agent. A tube segment,

5. FIRE PROTECTION OF STRUCTURES

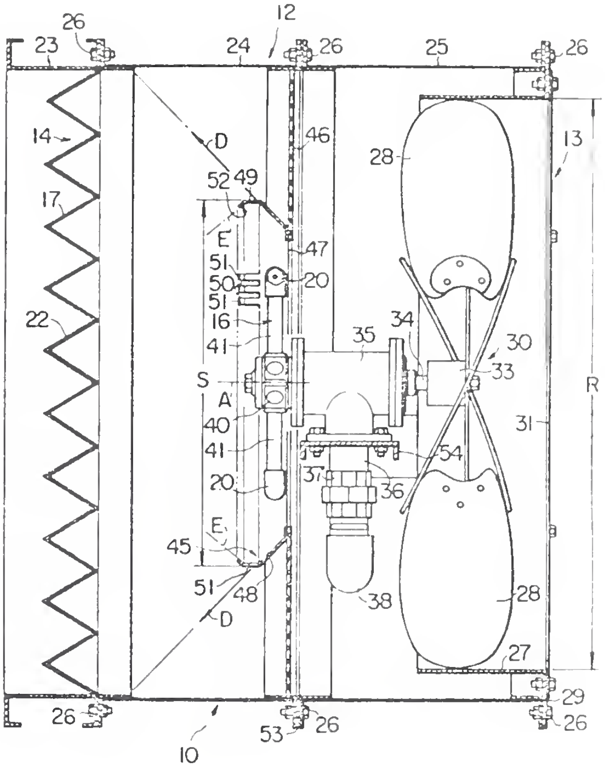
d. Extinguishing Agents, Additives, and Equipment—Continued

one end of which is flared and molded into the housing, and the other end of which extends through the discharge opening and is attached to the cylinder by a threaded sleeve, serves to mount the head assembly to the cylinder. In an alternate embodiment, the body of the head assembly includes a handle symmetrically disposed with respect to the center of gravity of the fire extinguisher for improved portability. 17 claims, 14 drawing figs. (Author)



304. Noguchi N
WATER-POWERED FIRE-FIGHTING FOAM GENERATOR
US Patent No. 3,999,612; Cl 169/14, (A62C 35/00), Appl 8 Dec 1975, Discl. 28 Dec 1976, Assignee: Nohmi Bosai Kogyo KK, Tokyo, Japan

An apparatus for generating high-expansion foam is patented. The disclosed apparatus includes an elongated housing having an inlet and an outlet and a perforated member extending across its free passage area. A fan is positioned in the housing and drivingly rotated by impulse nozzles supplied with pressurized liquid foam solution. The nozzles are arranged tangentially to the rotational axis of the fan, in a plane normal to the axis. A deflector is positioned around the nozzles so as to direct jet spray of the liquid foam solution partially toward the central portion of the perforated member and partly toward the outer edge portion of the perforated member to provide a relatively uniform wetting of the perforated means. The deflector further provides means for permitting all the nozzles to be directed tangentially to the rotational axis in design and to be mounted at the greatest possible distance from the shaft to provide the largest moment arm in order to increase percentage of the power available in the water supply. 4 claims, 2 drawing figs. (Author)



305. Riley JF and Stauffer EE
EXTINGUISHING AGENT FOR COMBUSTIBLE METAL FIRES
US Patent No. 3,985,658; Cl 252/7, (A62D 1/00), Appl 16 Apr 1975, Discl. 12 Oct 1976, Assignee: US Energy Res and Dev Admin, Washington, DC

This patent relates to a low-chloride extinguishing agent for combustible metal fires comprising from substantially 75 to substantially 94 weight percent of sodium carbonate as the basic fire extinguishing material, from substantially 1 to substantially 5 weight percent of a water-repellent agent such as a metal stearate, from substantially 2 to substantially 10 weight percent of a flow-promoting agent such as attapulgus clay, and from substantially 3 to substantially 15 weight percent of a polyamide resin as a crusting agent. 10 claims, no drawing figs. (Author)

306. Vaughn FS
MOBILE HOME FIRE EXTINGUISHING SYSTEM
US Patent No. 3,993,139; Cl 169/62, (A62C 35/12), Appl 17 Sep 1975, Discl. 23 Nov 1976, Assignee: Author

A fire extinguishing system is disclosed for a mobile home having a roof, side walls and a floor enclosing living spaces to which water may be supplied through a water line. The fire extinguishing system includes a trunk line mounted to the roof connected with the water line, a plurality of branch lines coupled with the trunk line and extending down through openings in the roof into the living spaces, means for inhibiting water exterior the branch and trunk lines from passing through the roof openings, and a plurality of branch lines within the living spaces. 7 claims, 6 drawing figs. (Author)

307. Brodskiy GE and Krasil'nikov AV
FOAM GENERATOR FOR THE PREPARATION OF A MECHANICAL FOAM
USSR Patent No. 503,581; Cl A62C 5/04, Appl 5 Jul 1974, Discl. 10 Jun 1976, Assignee: Leningradskiy Zonal'nyy NI i Proekt In-t Tipovogo i Eksperim Proekt Zhilykh i Obshch Zdaniy, USSR

The generator consists of a foam proportioner, a mixing chamber, a nozzle device for the supply of a resinous composition, a compressed air spraying nozzle, a foam conduit, and a pipeline for the production of an oxygen fog. In order to increase the expansion ratio of the foam, the proportioner is made in the form of a cup-shaped reflector with recurved edges and is equipped with a central cone inverted toward the flow of mixture; the compressed-air spraying nozzle is located inside the nozzle device for the supply of the resinous composition.

308. Gevlich VN, Kazakov MV, Karpov VI, Kirillov AP and Yudaev AI
METHOD OF OBTAINING A FOAM CONCENTRATE
USSR Patent No. 489,514; Cl A62D 1/00, Appl 25 Sep 1973, Discl. 20 Feb 1976, Assignee: VNII Protivopozharnoy Oborony, USSR

A method of producing a foam concentrate is described. The method includes sulfonation, neutralization and purification of petroleum fractions. In order to increase the fire-extinguishing efficiency of the concentrate and to simplify the process, hydraulically purified oil fractions are used as the starting material.

309. Melikhov AS, Tret'yakov VA, Bolod'yan IA, Kalinin VI, Potyakin VI and Daynis LI
DEVICE FOR STUDYING THE PROCESS OF EXTINGUISHMENT OF BURNING MATERIALS
USSR Patent No. 500,498; Cl G01N 25/50, Appl 25 Dec 1973, Discl. 12 May 1976, Assignee: VNII Pozhar Okhrany, USSR

The device consists of two chambers separated by a damper and containing specimen holders, branch pipes for supplying and exhausting gas, a pipe with a nozzle for supplying the fire-extinguishing mixture, a primer, and a pressure-temperature gauge. In order to increase the accuracy and reproducibility of research results, the specimen holder, the primer, and the pressure-temperature gauge are mounted in one chamber and the pipe supplying the fire-extinguishing mixture is located in the second chamber opposite the damper in such a way that when the damper is opened, the jet from the pipe hits the specimen, while the oxidizing gas source is connected to both chambers.

310. Sapozhnikov VA, Markelov VM and Golger MYa
DEVICE FOR THE AUTOMATIC CONTROL OF WATER AND FOAM FIRE-EXTINGUISHING SYSTEMS
USSR Patent No. 487,644; Cl A62C 37/04, Appl 7 Aug 1973, Discl. 18 May 1976, Assignee: Spets Proekt-Konstrukt Byuro Protivopozhar Automatiki, USSR

The device consists of a trunk pipeline, an automatic control and alarm circuit, and pump actuation circuits. In order to increase the operating reliability of the system in extinguishing fires, the trunk pipeline is equipped with a combination sensor and flowmeter whose break contacts are series-connected to the automatic control and alarm circuit.

311. Chambers GD
FLIGHT LINE EXTINGUISHER EVALUATION. FINAL TECHNICAL REPORT. DEC 75-SEP 76. DoD Aircraft Ground Fire Suppression and Rescue Office, Wright-Patterson AFB, OH; DoD AGFSRS-76-9, 93 pages, Jan 1977
Availability: NTIS AD-A038 380/2GA

A two-phase test program was conducted to determine the optimum mechanical conversion of the FEU-1, CB-10 flight line fire extinguisher to enable it to utilize Halon 1211 (Bromochlorodifluoromethane) as the fire extinguishing agent instead of Chlorobromomethane (CB). Phase I tests included static discharges to determine the optimum nitrogen pressurization and fill ratios for both an internally pressurized and externally pressurized configuration. Tests were also conducted to screen the most effective nozzles from a group of about 16 to evaluate further on live fires during Phase II. The first phase also included tests to determine the area of fire likely to occur when various amounts of jet (JP4) fuel are spilled on a hard, flat surface. Phase II included live fire tests using the nozzles, pressures and fill ratios selected as candidates in Phase I. After the completion of fire tests to determine the optimum combination of hardware using experienced operators, the effectiveness of the appliance in the hands of novice operators was also studied on simulated fuel spill fires, as well as engine fires, tire fires, and three-dimensional aircraft fires. Following the fire tests, the selected configurations were discharged after conditioning to tropic and arctic conditions to find out if the units were still operable and effective. (Author)

312. Corrie JG
THE FIRE RESEARCH STATION FOAM VISCOMETER — ITS CONSTRUCTION AND USE. Fire Res Sta, Borehamwood, UK; Fire Res Note 1059, 16 pages, 6 figs, 1 table, 1 ref, Apr 1977

Instructions for the construction of a standard foam viscometer for measuring the shear stress of fire-fighting foam are provided. The important points in the design are described. Standard procedures for its calibration and use are recommended. (See Fire Res Note 1055 for a description of the studies leading to the design and use of this instrument.) (Author)

313. Rogers SP and Young RA
THE PERFORMANCE OF AN EXTRA LIGHT HAZARD SPRINKLER INSTALLATION. Fire Res Sta, Boreham-

wood, UK; Fire Res Note 1065, 17 pages, 9 figs, 4 tables, 1 ref, Apr 1977

Two experiments were carried out to assess the effectiveness of an extra light hazard sprinkler protection system, installed to comply with the Fire Offices' Committee 29th Edition Rules, in a simulated open plan office. The results of these tests showed that the design area of operation, which dictates the water supply requirements of the sprinkler system, is by far the most critical factor in the success or failure of the sprinkler system in controlling the fire. (Author)

314. Rogers SP and Young RA
THE PROTECTION OF HIGH-RACKED STORAGES BY COMMERCIAL ZONED SPRINKLER SYSTEMS. Fire Res Sta, Borehamwood, UK; Fire Res Note 1068, 24 pages, 12 figs, 4 tables, 9 refs, Apr 1977

As a result of the successful development by the Fire Research Station of a high-speed zoned sprinkler system for the protection of high-racked storages, two systems designed specifically with commercial requirements in mind were purchased from two British sprinkler manufacturers. Nineteen full-scale fire experiments were conducted using one or the other of these systems. The results showed that both were very effective in controlling fires within high-racked storages, limiting fire, water and smoke damage to a minimum. (Author)

315. Hill R
EVALUATION OF A HALON 1301 SYSTEM FOR AIRCRAFT INTERNAL PROTECTION FROM A POST-CRASH EXTERNAL FUEL FIRE. FINAL REPORT SEP 75-MAR 76. Nat Aviat Facilities Experim Center, Atlantic City, NJ; FAA NA-76-42, FAA RD-76/218, 28 pages, Mar 1977
Availability: NTIS AD-A039 058/3GA

The use of a Halon 1301 fire-suppression system was evaluated in regard to increasing occupant escape time during a ground crash situation with an external fire adjacent to a cabin opening. Tests were conducted in a DC7 fuselage, varying the exit configurations and external wind conditions. Tests were also conducted using a curtain to compartmentize the cabin, with the Halon 1301 concentration and location of discharge being varied. Smoke, temperature, carbon monoxide, oxygen, and Halon 1301 levels were continuously monitored during the tests at various locations throughout the cabin. Hydrogen fluoride (HF) and hydrogen bromide (HBr) concentrations were obtained by analyzing samples taken from the cabin at various times. The results indicated that the length of protection from flame penetration through an opening was dependent upon external wind conditions. Flame penetration was controlled for up to 3.5 min with zero wind, but with a wind of as little as 2 miles per hour (mi/h), the time was reduced to less than 15 sec. High HF levels were rapidly reached inside the cabin, with concentrations ranging from 60 parts per million (p/m), with no wind, to well over 300 p/m with 2-mi/h wind conditions. Test results also indicated that the use of a curtain to compartmentize the cabin could slow the spread of HF (15 to 20 seconds), but it does not lower the levels reached. (Author)

316. Wakamiya SK and Calvano NJ
SAFETY PROBLEMS ASSOCIATED WITH PRESSURE CONTAINERS. Nat Bureau Standards, Washington, DC; NBSIR 77-1217, 43 pages, Mar 1977
Availability: NTIS PB-264 691/7GA

Accident reports from hospital emergency rooms and reports of interviews with accident victims were reviewed to determine the probable causes of accidents involving two types of pressure containers: fire extinguishers and liquefied petroleum (LP) gas tanks. The data collected and reviewed during the study suggests that some of the safety problems associated with fire extinguishers involve: 1) incompatibility of the contents of an extinguisher with its shell; 2) faulty method of attachment of extinguishers; and 3) widespread use of obsolete extinguishers. The primary hazard associated with LP gas containers appears to be leakage from various parts of the LP system. In many instances leaking gas accumulated in a closed area and was accidentally ignited, resulting in an explosion. Engineering standards relevant to the safety of fire extinguishers and LP gas tanks were reviewed. Although the present standards governing these pressure containers address most safety problems adequately, a few of the requirements in some of these standards appear to be of questionable value in preventing certain types of accidents. (Author)

317. Leonard JT, Fryar A and Countess R
WETTING AND SMOKE KNOCKDOWN CHARACTERISTICS OF SURFACTANT SOLUTIONS. Nav Res Lab, Washington, DC; NRL MR-3449, 15 pages, Feb 1977
Availability: NTIS AD-A037 379/5GA

Ninety surfactants of various types (anionic, cationic and nonionic) were screened for their ability to wet smoke produced by burning JP-5 fuel. The smoke was drawn through a gas sampling scrubber containing the solution of the surfactant in either distilled or salt water. A visual rating was given on the ability of the surfactant solution to wet the smoke particles. Seventeen surfactants were found to exhibit superior wetting characteristics for JP-5 smoke. The surfactants were also evaluated for their ability to knock down JP-5 smoke in a small chamber. (Author)

e. FIRE LOADS AND HEAT EFFECTS ON STRUCTURES

318. Anon
FIRE ENDURANCE OF BUILDING STRUCTURES [Ognestoykost Stroitel'nykh Konstruktsiy]
Sb Tr VNII Protivopozhar Oborony; (4), 1976
VNII Protivopozhar Oborony, Moscow, USSR; 119 pages, 1976 (Russian)

This 4th issue of the series entitled "Digest of Papers of the All-Union Fire Protection Research Institute" contains papers presenting the results of theoretical and experimental research on the fire endurance of building and ship structures that has been carried out at the All-Union Fire Protection Research Institute, the Reinforced Concrete Research Institute, the Moscow Structural Engineering Institute, and elsewhere. Data are given on the fire endurance of modern reinforced-concrete, metal, wood, light-protective, and ship structures. The thermal-engineering problem of calculating the fire endurance of structures was solved by computer. The characteristics of change in the strength and deformation properties of light concretes and aluminum alloys at high temperatures are determined. The causes of explosive spalling of reinforced-concrete structures when heated are examined and calculation methods are explored. The eleven papers are as follows: Fire Endurance of Deflectable Components with a Thermally Stabilized Reinforcement, by AI Yakovlev, AF Milovanov and KA Saydidlaev (3-15); Study of the Heating Process of Flat Structures, by AI Yakovlev and LA Sheynina (16-41); Explosive Spalling of Concrete, by VV Zhukov *et al* (42-57); Estimating the Fire Endurance of Structures Taking Explosive Spalling into Account, by VM Roytman (58-70); Explosive Spalling Tendency of Coarse-Grained Silicate Concrete, by LV Sheynina (71-75); Fire Endurance of Wall Panels Made of Silica Concrete, by LV Sheynina (76-79); Temperature Calculations in Reinforced Concrete Structures, by VA Makagonov (80-85); Fire Endurance of Light Barrier Structures, by VP Bushev (86-94); Fire Endurance of Wooden Frames, by VP Bushev and VS Kharitonov (95-101); Heat-Transfer Characteristics of Mineral-Wool Structures, by AG Berezhnoy and PE Zhavoronkov (102-109); and Fire Endurance of Ship Structures, by NF Gavrikov (110-117). (RZh)

319. Anon

PROTECTION AGAINST DISASTER AND THE APPLICATION OF ALUMINUM IN THE YASUDA FIRE AND MARINE INSURANCE COMPANY BUILDING

Aruminyumu; (550):7-9, 1976 (Japanese)

The design and finishing of the building housing the Yasuda Company, which has specialized in marine fire insurance, are described. A prominent feature of the building is the wide use of aluminum as the material for the load-bearing members, as well as for various components of the interior and exterior finishing of the building. The highly effective qualities of aluminum components, especially their fire resistance, heat stability and corrosion resistance, as well as the economic benefits, owing to the comparatively low cost of prefab aluminum components, are emphasized. The various advantages of such components compared to traditional building materials are illustrated. Specific recommendations for a broader use of aluminum in the construction of urban office buildings in order to increase their fire safety are presented with particular emphasis on the cost effectiveness. 5 figs. (RZh)

320. Lie TT

TEMPERATURE DISTRIBUTIONS IN FIRE-EXPOSED BUILDING COLUMNS

ASME Trans. Ser C. J Heat Transfer; 99(1):113-119, 1977

A procedure based on a finite difference method is described for calculating the temperature history of fire-exposed protected steel columns with rectangular cross section and heat generation or absorption in the insulation. Comparison with results of tests and those obtained from an analytical solution of the heat transfer equations indicates that the accuracy of the method is adequate for fire engineering purposes. The method is also suitable for the calculation of temperatures in monolithic building components such as solid concrete columns, beams, and walls. It can also be used for the calculation of temperatures of any system in which a perfect conductor or well-stirred fluid is enclosed in an encasement, for example, water-filled hollow steel columns or beams, and exposed to a radiative heat source of varying temperature. 7 figs, 2 tables, 12 refs. (Author)

321. Meyer-Ottens C

FIRE RESISTANCE TIME OF CONCRETE STRUCTURES, PREFABRICATED CONCRETE AND MASONRY CONSTRUCTION. PART 1

Betonwerk + Fertigteil-Tech; 42(6):275-281, 1976 (German; English and French Summaries)

An attempt is made to assemble the most important design principles, from the fire-protection viewpoint, for the production of concrete structures, with particular emphasis on prefabricated concrete and masonry construction, in accordance with the latest version of German industrial standard DIN 4102. 8 figs, 10 tables, 13 refs. (Author)

322. Meyer-Ottens C

FIRE RESISTANCE TIME OF CONCRETE STRUCTURES, PREFABRICATED CONCRETE AND MASONRY CONSTRUCTION. PART 2

Betonwerk + Fertigteil-Tech; 42(7):350-356, 1976 (German; English and French Summaries)

Discussed in this article is the length of time over which concrete structures remain fire-resistant, with particular reference to prefabricated and masonry construction. Special attention is given to the fire resistance time of load-bearing and nonload-bearing walls, including external walls (parapets) and fire walls, and of columns, ceilings, and beams. 8 figs, 12 tables, 13 refs. (Author)

323. Anon

NUMERICAL METHOD OF PREDICTING THE FIRE BEHAVIOR OF STEEL STRUCTURES

Cah Cent Sci Tech Batim; 175(1411):1-43, 1976 (French)

The aim of this paper is to determine methods of calculation and verification of the fire behavior of steel structures so as to be able to establish the degree of fire stability of metal construction components. Verification of the fire stability of a structure consists in determining, by calculation, what would be the incidence of destruction of a single component or a subset of components versus the degree of fire stability required. 35 figs, 17 tables, 54 refs.

324. Anon

GYPSUM — THE FIRE RETARDANT

Fire Service Inf; 7(6):4-5, 1976

Following a historical review of measures designed to insulate building components, an effort is made to explain why gypsum is fire-retarding. It is stated that gypsum is a mineral sponge that can store water up to 40% of its volume. When exposed to heat, it releases the water and gives protection against the heat or vaporizes, drawing off heat. The consequences of this fire-retardant mechanism of gypsum and useful applications are described, which have proved their value time and again in the fire protection of building components. A fire test is shown in a figure that demonstrates the number of hours that gypsum is capable of enduring exposure to heat. 1 fig. (Fachdok 13/0723)

5. FIRE PROTECTION OF STRUCTURES

e. Fire Loads and Heat Effects on Structures—Continued

325. Green MF [*Dept of Health and Social Secur, UK, Surveying Div*]
A SURVEY OF FIRE LOADS IN HACKNEY HOSPITAL
Fire Technol; 13(1):42-52, 1977

This paper describes and presents the results of a survey of the combustible content of various accommodations in Hackney Hospital. Fire load densities ranged from about 10 kg m^{-2} in some wards to more than 1,000 kg m^{-2} in some storerooms. When considered in conjunction with the substantial cost of providing structural fire resistance, this range of fire load densities suggests that, in existing buildings, greater cost-effectiveness may follow from the stipulation of required fire resistances in a detailed and flexible manner, rather than in terms of a blanket requirement to cover all types of accommodations in hospitals. 2 figs, 4 tables, 7 refs. (NFPA)

326. Polzow W
RAPID DETERMINATION OF EXISTING FIRE LOADS — FIRE LOAD CALCULATION
Unser Brandschutz; 27(1):5-6, 1977 (German)

A simple and rational method of calculating the fire load is demonstrated. The principle on which the calculation is based is a compilation of fire-load values for individual components and items of furnishing that is not yet complete. Nine computational examples are presented for a workroom, dining room, bedroom, locker room, etc. 10 tables. (Fachdok 13/0514)

327. Fristrom RM and Funk JA
BEHAVIOR OF BARRIERS UNDER THERMAL AND RADIANT STRESSES. STATUS REPORT NO. 1. Johns Hopkins Univ, Appl Phys Lab; APL/JHU FPPM-1-77, 29 pages, 9 figs, 5 tables, 13 refs, Mar 1977
Availability: APL/JHU

The burning characteristics and failure modes of plywood-polyurethane composites were studied. Specimens were furnished to APL by the US Bureau of Mines, and several commercially prepared barriers were also studied. The conditions such as air flow, temperature, humidity, and pressure across the barrier simulated those of a mine. The thermal attack simulated the range expected from a mine fire. The combustion research facilities of APL were utilized with two specialized pieces of apparatus called the "static test rig" (SR) and "combustion-ignition tunnel" (CIT). The report summarizes the studies and the conclusions that can be drawn from the present analysis. (Author)

328. Fung FCW
A COMPUTER PROGRAM FOR THE THERMAL ANALYSIS OF THE FIRE ENDURANCE OF CONSTRUCTION WALLS. Nat Bureau Standards, Inst Appl Technol, Center for Fire Res; NBSIR 77-1260, 61 pages, 16 figs, 1 table, 11 refs, May 1977
Availability: NTIS

A general one-dimensional transient heat and mass transfer numerical program has been developed for composite building constructions. Since typical building constructions consist of a series of composite layers and intermediate air layers, transient heat transfer is modeled by conduction through solids and by radiation and convection through air spaces. In addition, the program has built-in features for ease of application to building constructions where various combinations of solid-to-solid and solid-to-air interfaces are encountered. The complex Fortran language program as used on the NBS Univac 1108 computer is given. A discussion of the program and instruction for its use are facilitated by the aid of examples. Numerical solutions using the present program compare favorably with experimental data in standard fire endurance tests. (Author)

f. FIRE PREVENTION AND HAZARD REDUCTION

329. Fernandez-Menendez JR and Garcia FA
THE FIRE HAZARD OF A ROLLING MILL
ASELF; (56):47, 49, 51, 1976 (Spanish)

The high fire hazard of a rolling mill is due to the presence of a large quantity of oil in many production processes in conjunction with the high temperatures prevailing on individual items of equipment and hot metal particles. In addition, other fire sources are welding during repair work and short circuits in the electrical equipment. The hot gases used in the fireboxes of various furnaces are another dangerous fire source. The effectiveness of various fire extinguishing means in a rolling mill depends on the size of the seat of the fire. Fire extinguishers and other primary means can be used successfully if the fire is small. In a number of plants in Western Spain, eg, 56.9% of the 86 fires during the period of July-August were put out with fire extinguishers. Oil reservoirs are usually protected with fixed oil-foam extinguishing systems. Serious attention must be paid to fire prevention because, as the statistics show, 80% of the fires occurred during welding repair work. (RZh)

330. Jens J [*Hamburg Fire Dept, FRG*]
DEMOLITION OR RESTORATION OF OLD BUILDINGS
Brandschutz; 31(3):62-64, 1977 (German)

A fire-protection expert deals with the problem of whether old buildings should not be demolished for fire safety reasons. The face-lifting of facades and the installation of modern sanitary and heating systems are not enough if no thought is given to the hazards of a fire. This problem arose on the occasion of a large fire in an old house in Hamburg that claimed two lives. The structural features of the fire premise, the rescue and extinguishing operations are described. Some fire safety deficiencies of old buildings are pointed out and proposals for expedient elimination of the deficiencies are made. 9 figs. (Fachdok 13/0581)

331. Wankowicz S [*Centrum Techniki Okretowej, Gdansk, Poland*]
PROBLEMS OF STATIC ELECTRICITY ON TANKERS
Budow Okretowe; 21(8):361-365, 1976 (Polish; English and Russian Summaries)

Tankers carrying crude oil and similar liquids present the greatest danger of explosion caused by electrostatic discharges. The conditions under which fire may break out or explosions may occur on tankers are described. Electric field strength studies conducted by the International Chamber of Shipping on tankers are discussed and methods of protection against the effects of static electricity are presented. Conclusions relating to research work are also drawn. 7 figs, 3 tables, 11 refs. (Author)

5. FIRE PROTECTION OF STRUCTURES

f. Fire Prevention and Hazard Reduction—Continued

332. Dlugosz B [*Inst Energetyki Pracownia Kabli, Poland*]
CIRCUMSTANCES AND EFFECTS OF CABLE INSTALLATION FIRES IN POWER PLANTS
Energetyka (Poland); 30(10):355-357, 1976 (Polish)

Survey material on the subject of circumstances and effects of cable installation fires in the period 1963-1973 was collected in 1974 in the form of an inquiry aimed, among other things, at domestic power plants. The collection of this material was done in connection with an international inquiry relating to the fire hazard resulting from the use of PVC cable sheathings which was circulated by the Polish Study Committee of UNIPEDE. The principal results of an analysis of this information, which was carried out by the Power Engineering Institute, were disclosed in a report published in 1975. Presented in this article are the most important results of an analysis of the circumstances and effects of cable installation fires in thermal power plants, that is, in plants with the greatest number of cable fires. 3 tables, 1 ref.

333. Anon
EXPLOSIONS AND FIXED FIRE-PROTECTION FACILITIES
Face au Risque; (126):45-53, 1976 (French)

The various kinds of explosions are described and defined. Fire spread resulting from explosions is described, and the property damage caused by explosions is examined in all its ramifications. The vulnerability of fixed fire-protection systems to powerful explosion pressures is discussed by resorting to examples from around the globe. Under normal conditions, however, their protective efforts are indisputable, especially when additional supplementary fire- and explosion-inhibiting measures are taken. Reports of fires that led to explosions and the destruction of sprinkler systems are given in an appendix. Outlines lend insight into each situation. 6 figs. (Fachdok 13/0545)

334. Myachin VA [*PKTI, Lipetsk, USSR*]
DETERMINING THE EXPLOSION AND FIRE HAZARDS OF PAINT SHOPS
Lakokras Mater Ikh Primen; (6):64-65, 1976 (Russian)

Most solvents of paint materials belong to the highly flammable and combustible-liquid classes, whose vapors form explosive mixtures, mostly with a flash point below 28°C. In designing paint shops, therefore, special explosion- and fire-safety requirements must be adhered to, resulting in a more complex structure and equipment, and also in greater building and operating costs. In planning the technological part of a paint shop, calculations must take into account the explosion- and fire-hazard category of the production process, the explosion and fire hazard class of the permise and of the equipment, and the category and group of the explosive mixtures. The USSR standards governing the explosion and fire safety of such shops are enumerated and discussed and discrepancies are pointed out. 5 refs.

335. Anon
FIRE PREVENTION AND CONTROL ON CONSTRUCTION SITES
Nat Saf News; 115(6):83-89, 1977

This Data Sheet 491, 1977 Revision C, of the National Safety Council covers both the planning of a fire protection and control program for construction sites and the continuation of the program during construction. The revision relates to fire prevention, fire protection measures, identification and control of hazards, fire control measures, and fire hazards. A portable fire extinguisher selection chart shows Underwriters Laboratories Inc classifications, characteristics, and NFPA maintenance requirements. A typical fire safety checklist (self-inspection form for construction work) runs through the different conditions to be monitored in the program. 8 figs, 1 chart.

336. Klodnicki A
FIRE HAZARDS AND PROTECTION IN COMPUTER CENTERS
Przege Poz; 64(8):2-4, 1976 (Polish)

A fire occurred in a computer center in Bydgoszcz, Poland, in 1975. The fire was caused by a short circuit in the electrical motor of a computer fan. The flame spread over the insulation of the wires and plastic parts. The loss was 30 million zlotys. The fire revealed some specific aspects of computer fire protection. The fire hazard consists in the large number of motors and the large quantity of plastics. The following recommendations have been made to ensure fire safety: installation of individual safety devices in every motor; reduction of the number of plastic parts, especially PVC, since it generates much chlorine when it burns, damaging the computer and impeding firefighting. Requirements for computer buildings and rooms are formulated. Computer centers should be partitioned into areas separated by C-class fire walls. Areas with a fire load greater than 100 kg/m^2 should be partitioned off by fire walls. Each area should be equipped with a separate ventilation and air-conditioning system. Ionization or optical sensors should be installed beneath the floor and ceiling, in ventilation ducts and computers in order to detect and warn of fires in the area. Gas fire extinguishing systems with CO_2 or Halons should be used to extinguish computer room fires. 4 figs. (RZh)

337. Akaogi I, Torii S and Oyama S
EFFICIENCY OF OIL ABSORBENTS. PART 2
Fire Sci Lab Japan. Rep; (13):135-138, 1976 (Japanese)

Given are comparative results of laboratory tests aimed at evaluating the effectiveness of polypropylene, polystyrene, urethane foam and several other compounds as absorbents, which, when used in combination with fire- and explosion-hazardous petroleum products, permit an appreciable increase in petroleum-product storage safety. The studies were conducted from May 1 to May 12, 1975, by the Tokyo Fire Safety Research Institute. Also reported are some of the methods used in the investigations. 6 tables. (RZh)

338. Fushimi H and Kawada T
PREVENTION OF OVERFLOW FROM OPEN STORAGE TANKS. PART 1
Fire Sci Lab Japan. Rep; (13):13-17, 1976 (Japanese)

It is pointed out that prevention of overflow of liquid petroleum products from fixed open storage tanks as a result of earthquakes and seismic events promotes an increase in the fire safety of these tanks and surrounding facilities. The results of analytical investigations that formed the basis for mathematical formulas establishing a relationship between the parameters of waves excited in oil storage tanks (amplitude, period, propagation rate, phase) and the parameters of the dynamic effects causing wave generation (amplitude, length, strength, frequency, direction, and point of application of the force vector) are given. Several variations of the design of spring-type dampers attached between the wall of the tank and the base and designed to compensate (in part, at least) for the dynamic effects are proposed. Also recommended for this purpose are massive rubber and inflatable mats, porous absorbing packings, etc. Graphic materials illustrating the effectiveness of these damping devices and packings are presented. 16 figs, 5 refs. (RZh)

339. Fushimi H and Kawada T
PETROLEUM STORAGE FACILITIES ON LAND SUBJECT TO SEISMIC WAVE EFFECTS
Fire Sci Lab Japan. Rep; (13):18-21, 1976 (Japanese)

The methods and results of studies in which standard fixed storage tanks for fire-hazardous petroleum products were subjected to various kinds of shock and vibration effects simulating seismic events are described. The resonance-wave properties of the tanks were evaluated; in particular, the most hazardous portions of the vibration frequency spectrum close to the characteristic vibration frequency of the tank structures. It is pointed out that one of the negative factors during earthquakes and seismic events is coincidence between the frequency of these events and the characteristic vibration frequency of various facilities, especially fixed tanks. Interfering resonance phenomena that can destroy the tanks are a result of frequency coincidence. Tanks with a capacity of 300 ℓ − 300 kl made of different kinds of steel were tested. Seismic events with a low-frequency spectrum ranging from 0.3 to 130 Hz and differing amplitudes were simulated by means of a special vibration test stand. Also varied were the duration of the events and the location of the point of application of the forces to the tank structure. The energy frequency spectra of the characteristic vibrations are given for each type of tank tested. Also presented are the mathematical tools, which were obtained analytically and which confirm the results of the studies. 3 figs, 2 tables, 18 refs. (RZh)

340. Fushimi H and Kawada T
PREVENTION OF PETROLEUM FROM SLUDGING IN OUTDOOR STORAGE TANKS. PART 4
Fire Sci Lab Japan. Rep; (13):22-28, 1976 (Japanese)

Several of the types of protective devices that prevent contamination and evaporation of petroleum products stored in stationary cylindrical outdoor tanks are described. One of the most effective means is floating roofs, which permit appreciable reduction (by a factor of 7-9) of the loss of petroleum products to evaporation compared to liquids stored in ordinary vertical cylindrical tanks. These roofs also provide reliable protection of the surface of the petroleum products against dust and precipitates. Specific designs of floating roofs make it possible to protect more than 95% of the surface level of the petroleum products. In the designs considered here the roofs have a gap of 100-180 mm to permit free displacement. This gap is closed by a special seal fixed to the perimeter of the roof. The seal is a combination of several hinged arm systems, which provide packing and protection from atmospheric residues. These roof designs differ from each other in that they have different hinged pipe sections to drain rain water into the storm sewers. Recommendations are suggested for the storage of not all petroleum products in floating-roof tanks, but only those with a bulk weight of 0.7-0.85 t/m^3. Also considered are designs of other protective devices for the same purpose, especially pontons with concentric annular and radial fins. These are structures with a bottom made of sheet steel reinforced by fins. It is pointed out that pontons with radial fins are more effective because they lend greater strength and stability to the bottom and also better flotation. The outlook for the use of pontons made of synthetic materials, such as for use with vertical cylindrical tanks of 300-30,000 m^3 capacity, is analyzed. Such a ponton structure consists of floating cellular plastic chambers, a 3-layered protective polyamide film, and a metal grid designed to neutralize charges of static electricity on the surface of the liquid petroleum. 19 figs. (RZh)

341. Kiuti T and Yamagata M
HAZARDS RELATED TO LPG CYLINDERS IN CASE OF EARTHQUAKE
Fire Sci Lab Japan. Rep; (13):1-12, 1976 (Japanese)

A report is made on the development of a broad range of mechanical devices and systems to increase the safety of pressurized liquefied gas cylinders. These cylinders are the source of increased fire hazard in case of earthquakes and other accidental shock effects that might occur during operation since the probability of loss of airtightness of the pipe connections from the cylinder to a gas range, heater, or other appliances that require such cylinders is high when subjected to a dynamic shock of sufficiently high strength. Especially vulnerable in this regard are threaded pipe couplings of the rigid type, as well as rubber hoses used in flexible pipe connections. The principal components of the proposed protective devices are spring-driven valves which automatically close the discharge outlet of the cylinder and terminate the supply of gas to the burner of the primary user device when a special equilibrium circuit which reacts to dynamic events having certain parameters is triggered. In the tests whose results are presented here various parameters of dynamic events were specified, such as amplitude, frequency, duration, acceleration, and location of the point of application of the effects to the cylinder, and the operational reliability of the protective devices was analyzed. 15 figs, 7 tables, 3 refs. (RZh)

342. Kojima M, Torii S, Matsuhashi S and Kumazawa M
TEST OF GELATINIZATION OF LEAKED GASOLINE
Fire Sci Lab Japan. Rep; (13):139-143, 1976 (Japanese)

The methods and results of studies to determine the optimal conditions and parameters of the gelatinization of gasoline and alcohol are described. Several gelatinizing reagents were used for this purpose, one of the results being an assessment of the comparative effectiveness of these reagents. It is pointed out that gelatinization of fire-hazardous materials is an effective means of increasing their fire safety during storage; at the same time, it does not have an irreversible effect on the working characteristics of alcohols and fire-hazardous petroleum distillation products. In particular, gelatinization increases appreciably the viscosity of fire-hazardous materials, resulting in almost complete elimination of the hazard of their ignition by an accumulation of electrostatic charges and of sparking when they are tapped. These aspects are confirmed by the results of studying the electrostatic properties of a flow of gasoline and alcohol under various conditions, in particular at different ambient temperatures, at different jet flow rates and thicknesses, at varying humidities and aerodynamic conditions. The equipment, monitoring and measuring apparatus used during the studies, which were carried out mainly under laboratory conditions, are described. 4 figs, 4 tables. (RZh)

343. Wakabayashi K
FIRE AND EXPLOSION PREVENTION ENGINEERING
Soda to Enso; 27(9):302-311, 1976 (Japanese)

Interim results are presented of continuing analytical research aimed at establishing a correlation between the fire and explosion hazard of a system or premise, on the one hand, and the same factors of individual components of the system or premise, as well as the failure of these components, on the other hand, using the methods of mathematical statistics, in particular the theory of gamma functions. 4 figs, 4 tables, 1 ref. (RZh)

344. Igishev VG [*All-Union Mine-Rescue Res Inst, Eastern Div, USSR*]
EVALUATING THE INFLUENCE OF MINE ENGINEERING FACTORS OF THE REDUCTION OF THE ENDOGENOUS FIRE HAZARD
Ugol (*USSR*); (11):63-65, 1976 (Russian)

Studies conducted at the Eastern Division of the All-Union Mine-Rescue Research Institute (USSR) have made it possible to evaluate the influence of mine-engineering factors on the endogenous fire hazard. The results of these studies show that the hazard can be reduced by controlling such factors as ventilation, roof supports, the rate of level-course working of the field, and coal depletion. It was found that the hazard could not be reduced by exploiting the field from only one side instead of two, by reducing the size of the fields along the strike or vertically, by breaking the field down into sub-levels, or by cross-cut working of the field. 3 tables.

345. Anon
HAZARDS CONTROL PROGRESS REPORT NO. 52, JANUARY-JUNE 1976. Univ Calif (Livermore), Lawrence Livermore Lab; UCRL-50007-76-1, 62 pages, Aug 1976
Availability: NTIS

Progress is reported on radiation protection, industrial hygiene, instrument development, fire safety, and decontamination.

g. PRESSURE EFFECTS ON STRUCTURES

h. PROTECTIVE COMPONENTS AND CONTROL SYSTEMS

346. Belik IP, Gorbatenko AE and Pogrebnoy VM
VENTILATION MODES IN SUPPRESSING ENDOGENOUS FIRES
Bezop Tr Prom-sti; (12):43-44, 1976 (Russian)

If endogenous fires are to be effectively extinguished, the means for controlling ventilation modes, fire doors, must be kept in satisfactory operating condition. Rigid specifications for the design and tightness of the doors must be developed. The results of investigations and experience in fire suppression have shown that if these doors are to operate reliably when closed, they must be capable of reducing the air flow by no less than 90% of normal. In mine workings with air streams that are unstable during fires (when it is not possible to counteract the instability of the stream by controlling the air flow in parallel workings), the ventilation system must be reversed either in the entire mine or locally. 1 fig.

347. Potemkin V Ya, Svetlichnyy VP and Avramchuk RN
FEATURES OF VENTILATION MODES IN THE SUPPRESSION OF UNDERGROUND FIRES
Bezop Tr Prom-sti; (12):51-52, 1976 (Russian)

An effective ventilation mode is provided for in the accident suppression plan for mine pits to prevent the propagation of gaseous combustion products to active mine workings and to safeguard the escape of personnel from the affected mine areas. An analysis of the accident suppression plans in the mines of the Ministry of the Iron and Steel Industry of the Ukrainian SSR shows that the decisive part in these plans is relegated to maneuvering the ventilation system. In mines in which the air is handled by several ventilators, various combinations of ventilator modes, namely, reversing and stopping individual fans, are planned. The use of methods of industrial verification of emergency ventilation modes and of mathematical modeling on a computer will make it possible to achieve mine fire safety. 2 figs, 1 table.

348. Neumann H [*Hamburg Fire Dept, FRG*]
FIRE PROTECTION IN UNDERGROUND PASSAGEWAYS
Brandschutz; 31(4):112-113, 1977 (German)

The location of stores, shops, and display windows directly alongside underground passageways makes special fire-protection considerations necessary, such as the length of escape routes, stairs leading to the outside, width of exits, and extent of fire load in these areas. Requirements for the structural design are: at least F-90 walls and ceilings; no prestressed concrete bearing structures; facings and insulation of incombustible materials; fire and smoke compartmentation; and ventilation and air-conditioning systems in accordance with pertinent codes. The required safety and extinguishing systems are: sprinkler systems; wall hydrants; hose connections; fire detectors and alarms; smoke removal systems; and an emergency power supply system. The remodeling of the Hamburg-Altona railway station is an example of such a situation. (Fachdok 13/0740)

5. FIRE PROTECTION OF STRUCTURES

h. Protective Components and Control Systems—Continued

349. Anon
FIRE PROTECTION MEASURES IN UNDERGROUND STRUCTURES
Fire; 69(863):605-606, 1977

This report deals with the question of how to combine various fire protection installations, eg, smoke detectors, fixed fire-extinguishing systems, and automatically controlled smoke and heat vents in different types of underground structures, such as the underground floors of commercial and industrial buildings, department stores and shopping centers, and garages. 4 photos.

350. Powell BD [*Cumbria Fire Service, UK*]
SMOKE-STOPPING FIRE CURTAINS
Fire Eng J; 37(105):30-31, 1977

Smoke-stopping fire curtains or intermediate fire protection on extensive corridor escape routes as an alternative to the esthetically objectionable 30-minute self-closing fire-resisting door and their construction and installation are described. 4 figs.

351. Anon
INTUMESCENT SEALANTS FOR FIRE-RESISTANT BUILDING CONSTRUCTION
Fire Prot Rev; 40(438):36, 1977

A new intumescent sealant, a paste that is extruded from a gun or automatic applicator into grooves cut into the edges of doors or frames, as an alternative to intumescent strips, is described.

352. Anon
CAPE FIRE RESISTING BOARDS ARE IN USE ALL OVER THE WORLD
Fire Prot Rev; 40(439):20, 25, 1977

The composition, fire performance, and export statistics for the UK-produced Cape fire-resisting boards based on calcium silicate are reviewed. The production of a new asbestos-fire board called Supalux to replace the asbestos board Asbestolux is featured. Production processes and applications in the building industry, shipbuilding industry, as external wall linings, and as cladding materials are discussed.

353. Crouch JA and Harris BJ [*Cape Boards and Panels Ltd, UK*]
NON-COMBUSTIBLE MATERIALS FOR FIRE RESISTANT CONSTRUCTION
Fire Prot Rev; 40(441):16-17, 19, 1977

The primary reason for fire protection, that is, the preservation of life, requires the containment of any fire and prevention of its spread throughout a building and to nearby buildings, as well as protection of the structure to prevent collapse. The provision of light-weight fire-resistant casings to structural members, partitions, doors, wall linings and ceilings, fire stops, and so on, can play a large part in stopping a fire. Suitable in this connection are noncombustible insulation boards based on a calcium-silicate matrix with varying fiber reinforcement, the properties and applications of which are the subject of this paper, which was presented at the recent Civil Aviation Authority (UK) Fire Service Seminar at Stansted Fire Service Training School.

354. Bamert AE
FIRE DAMAGE PREVENTION IN UNDERGROUND STRUCTURES
Internat Zivilverteidigung; 24(260):4-8, 1977 (German)

The main hazards in underground fires are the intense generation of smoke, localization of heat, and smoke charging in access ways. The most effective countermeasures are mechanical smoke and heat vents, but at the same time preventing fire spread by the unavoidable input of fresh air. If necessary, the latter condition must be fulfilled by an automatic extinguishing system. In this case the ventilator power can remain low, reducing the danger of "fanning" the fire. Accordingly, in the event of fire the ventilation system should start up automatically, but not before the sprinkler system has responded. If there is no danger of fire spread and a fixed extinguishing system is not needed, smoke detectors should control actuation of the ventilation system. (Fachdok 13/0646)

355. Anon
BUILT-IN FIRE PROTECTION
Nat Saf News; 115(6):73-74, 1977

The fire protection program for a truck assembly plant is described. The measures taken in the basic design of the structure include fire walls, door closers, sprinkler systems, water tanks, and intumescent coatings for shelving. Special equipment and systems were provided for specific areas, such as the high-bay automated storage area, in this case a high-expansion foam system in which the solution is sprayed in a screen in an overhead generator producing tiny bubbles to smother the fire. The sensors, fire stations and equipment, fire brigade and evacuation drills are also discussed. 2 photos.

356. Hayashi T, Shibata M, Yamaguchi H, Sakurai H and Kanehara K
RESEARCH ON INFLATABLE SHUTTERS FOR FIRE PROTECTION. PART 2
Nihon Kasai Gakkai Ronbunshu; 26(1):15-25, 1976 (Japanese; English Summary)

The results of tests of a model of a push-pull air shutter aimed at determining its suitability for fire protection of buildings are presented. The simulation scale is 1:60. The leakage of smoke or gas through the shutters was determined for various air concentrations and flow rates. This work is a continuation of a preceding study in which shutters passing a small quantity of smoke (gas), and therefore considerably cheaper, were examined. The test methods, experimental and theoretical relations are given. A comparative analysis is made of various methods of measuring the smoke concentration. 18 figs, 1 table, 19 refs. (RZh)

357. Kloeker W
BUILDING-INSPECTION PERMITS FOR WALL COMPONENTS AND STRUCTURES MADE OF URETHANE-PLASTIC RIGID-FOAM LIGHT CONCRETE
Plasticonst; 7(1):7-10, 1977 (German)

The "Legupren" light concrete with urethane-plastic rigid foam as binding agent and granulated intumescent silicates as light mineral aggregates was put on the market. Owing to its properties, Legupren light concrete was used for structural elements of one story in height. As they were further developed, building-inspection permit procedures were generally introduced: 1) for frontally suspended, space-filling facade, parapet and wall components (8-15 cm thick) with a coating of fiberglass-reinforced Leguval on both sides; and 2) for a load-bearing wall structure made of Legupren light-concrete wall components (15 cm thick with a textile glass mat applied as a foam). The particular results of the work required for general building permits are reported. 9 figs, 9 refs. (Fachdok 13/0513)

358. Kurasawa K
FIRE VENTILATION SYSTEMS
Reito Kucho Gijutsu; 27(317):98-100, 1976 (Japanese)

The principal requirements for emergency ventilation systems designed for the rapid removal of smoke and toxic gaseous combustion products from production areas during a fire, as well as requirements for ordinary ventilation systems with provisions for exhaust operation in emergency situations, thus performing the tasks of the specialized systems, are set up. Such systems must be equipped with distributor devices to control the rates and volumes of air being displaced, and also with measurement and monitoring devices. Briefly examined are the design and operation of one such system run by powerful battery-operated fans providing a twelvefold air exchange. The system can be actuated either manually or automatically by a built-in gas analyzer. Also provided for is remote starting of the fans by an emergency lever located near the main outer doors of the building. It is emphasized that a system must not combine the exhaust of readily condensating vapors and substances that can form ignitable compounds when mixed with condensate. Especially rigorous requirements are imposed on the fire safety of self-contained ventilators installed in production areas in which readily flammable liquids are released. The possibility of spark formation from the rotor striking the housing must be completely eliminated. Contacting parts must be made of materials that do not cause sparks upon impact, such as steel and ferrous materials, and the electric motors must be explosion-proof, regardless whether they are synchronous or asynchronous. 2 figs, 2 tables. (RZh)

359. Kojima M, Asano K and Murakami T
TEST OF PRESSURIZED VENTILATION OF ESCAPE ROUTES
Fire Sci Lab Japan. Rep; (13):66-76, 1976 (Japanese)

The methods and results of complex operating tests of an emergency intake and exhaust ventilation system designed for use in large urban buildings are described. The design and floor-by-floor planning of several types of buildings in which this system was tested are described in detail. The test results illustrate the dependence of the convective flow parameters of the smoke removed from the buildings and of the gaseous combustion products on the power of the fans of the system (under various operating modes) and of the design features of the premises and buildings in which the tests were performed. Some recommendations on increasing the operating efficiency of these systems are given. 28 figs, 2 tables. (RZh)

360. Ueno O, Shima M, Saito M, Higuti M and Ikebe S
DEVELOPMENT OF A PORTABLE SMOKE DISSIPATOR. PART 6
Fire Sci Lab Japan. Rep; (13):46-51, 1976 (Japanese)

The design, operating principle, and results of fire tests of a portable device for the rapid removal of smoke in premises during a fire are described. The system comprises a smoke-collecting housing with a powerful fan to draw in smoke at the rate of 53 m³/min. Within the housing is an electrode charged to a high electrostatic potential of the order of 9.5 kW, which interacts electrostatically with the ionized soot particles of which smoke consists. As a result of this interaction the soot particles are attracted and deposited on the electrode. The rest of the air passes through a system of mechanical filters and is returned to the premise in purified form. The d-c power source is 100 V, 50 Hz; the installed capacity is 700 W; the current requirement is 20 mA. The size of the system is 960 x 675 x 430 mm; the weight is 72 kg. The smoke suppression coefficient is 80%. The results of testing the system during operation in various conditions and modes are given. The test stand and monitoring and measuring devices used in the tests are described. 6 figs, 1 table. (RZh)

361. Anon
NEW TECHNIQUES (IN FIRE PROTECTION)
Rev Tech Feu; 17(162):36-39, 1976 (French)

A survey is given of new protective and fire alarm systems, readily releasable locks for buildings with large masses of people, and gas distribution systems for hospitals. 5 figs. (RZh)

362. Anon
NEW LIFE SAVING EQUIPMENT
Schiff Hafen; 28(6):540, 1976 (English)

The life-saving cabin for accidents at sea now developed will provide onboard protected accommodation and has three functions: 1) fire-proof accommodation for the whole crew as long as it stays on board; 2) if the ship goes down, the cabin will be released automatically and float off; and 3) release by free fall if the heat effect from the fire is too heavy. Natural and internal ventilation, emergency communications, first-aid equipment, emergency food supplies, fresh water, etc, will also be provided in the rescue cabin. 2 figs.

363. Anon
FIRE PROTECTION
Tech Rundsch; 68(27):3, 5, 1976 (German)

A survey is made of fire protection measures, especially for industrial and administrative buildings. Discussed are: coatings for steel and aluminum alloy components, brick walls, concrete, and wood and the required fire-endurance thickness; thermal and flame insulation with polyurethane foam; fire-door stripping with intumescent Palusol; water-filling of hollow beams; special cables with heat-sensitive sheaths for fire warning; Halon 1301 fire extinguishing systems for computer centers, telephone stations, museums, archives, and the like; special devices for penetrating walls, ceilings, roofs, bulkheads, etc. 9 figs, 1 ref.

5. FIRE PROTECTION OF STRUCTURES

h. Protective Components and Control Systems—Continued

364. Janssen LML

SKYLIGHT AND SAFETY DEVICE

Belgian Patent No. 757,833; Cl E04D, Appl 22 Oct 1970, Discl. 7 Jan 1976, Assignee: Author

A patent is disclosed for a lock designed to release various safety devices, eg, a skylight vent, in case of fire. A rise in temperature melts a fusible plug and a spring-driven lever turns, releasing the fire-safety fixture, eg, a fire door. 6 claims, 17 drawing figs.

365. Chatel GAR and Agostini C

FIRE-RESISTANT PANELING, FIRE BARRIER WITH APPLIED LINING, AND PRODUCTION METHOD

French Patent No. 2,263,349; Cl E04B 5/38, Appl 8 Mar 1974, Discl. 3 Oct 1976, Assignee: Author

The patent disclosure relates to the design of paneling which is light, fire-resistant, thermally and acoustically insulated. Used in the paneling is a composite base made of light-concrete sheets onto which is mounted a reinforcing cage with a first layer of concrete. After it has hardened, boarding made of insulating sheets is applied and on top of them a concrete layer. 6 claims, 3 drawing figs.

366. Samson J

FIRE CURTAIN

French Patent No. 2,287,926; Cl A62C 2/02, Appl 16 Oct 1974, Discl. 14 May 1976, Assignee: Author

This invention relates to a fire curtain guided vertically by two tracks on either side of an opening between two compartments of a building, eg, a theater. The load-bearing portion of the curtain consists of horizontal rods made of refractory steel, connected pairwise by cable loops, the ends of the horizontal rods being guided in vertical tracks, thus making the curtain impermeable. An incombustible gasproof fabric is fixed to each side of the load-bearing portion. The space between the bearing portion and the facing is filled with a light heat-insulating material. The bottom of the curtain is formed by a cushion made of incombustible fabric filled with chamotte powder to provide an airtight seal. This cushion also acts as a reliable barrier to combustible liquids. The curtain descends by its own weight and can be released either manually or automatically. 5 drawing figs.

367. Anon

FIRE DOOR

French Patent No. 2,280,403; Cl A62C 3/14, Appl 25 Jul 1975, Discl. 27 Feb 1976, Assignee: Deutsche Metalltueren-Werke Aug Schwarze AG, FRG

This invention relates to a fire door which, on the one hand, affords better fire protection and, on the other hand, is ideally adapted to modern door styles. The door comprises a sash inside the door forming the frame of the door, completely encased in heat-insulating material, with facings made of sheet metal folded over the edge of the frame. The internal layer of air inhibits rapid penetration of fire through the door. 9 drawing figs.

368. Banto S and Watanabe T

SMOKE REMOVING DEVICE IN FIRES

Japanese Patent No. 51-7335; Cl 72 C 54, (B03C 3/00), Appl 23 Jun 1971, Discl. 6 Mar 1976, Assignee: Nihon Kogei Kogyo KK, Japan

A patent is disclosed for the circuit and operating principle of a smoke removal system to be used in premises during a fire. The system is based on the use of the effect of interaction between soot and gas particles, the main components of smoke, and electrodes with a high electrostatic potential that form part of the device. The system requires an aluminum foil (a thin metallized film) with reliable grounding on the surface of the floor, walls, or ceiling. A generator which delelops an electrostatic voltage is started automatically by a signal initiated from the output of a fire detector installed in the enclosure. The electrode connected to the output of the electrostatic generator is reliably insulated from the grounded aluminum-foil film and can be located anywhere within the enclosure. The system also requires a ventilator creating convection dynamics in the enclosure and thus intensifying the process of precipitation of the particles on the grounded surface, that is, the smoke-removal process. The system can be used for buildings of several floors and a large number of individual compartments. 3 drawing figs. (RZh)

369. Nakano Y

DEVICE FOR RAISING FIRE SHUTTERS

Japanese Patent No. 51-5215; Cl 89(2) D 335.1, (E06B 9/20), Appl 29 May 1970, Discl. 18 Feb 1976, Assignee: Komoku Denki KK, Japan

The design and operating principle of a small electromechanical device for the automatic opening (raising) of fire shutters at windows in the case of a fire are patented. The device is actuated by the output signal of a fire detector which passes through a polarized relay and closes the contacts of the power supply circuit of a reversible electric motor. The motor is a constituent part of the device which raises the shutters by turning a drum with a cable winding, the free end of the cable being connected with a shutter-raising lever. 2 drawing figs, 2 refs. (RZh)

370. Howells FJ

PARTITIONING

UK Patent No. 1,436,116; Cl E1W, (E04C 2/38, E04B 2/74), Appl 29 Apr 1972, Discl. 19 May 1976, Assignee: GKN Sankey Ltd, Bilston, UK

This invention pertains to fireproof sectional partitioning for use in ships and buildings. A partitioning panel comprises two metal side walls and a rigid prefabricated board of heat-insulating material (eg, vermiculite) between the side walls to hold them apart and out of contact, the side walls adhering to it to form a prefabricated integral assembly. The side walls have at least one edge, inturned planar flanges disposed in spaced parallel planes, each of a width less than one-half of the thickness of the panel, the shortest distance between the two flanges being not less than the shortest distance between the inner one of the flanges and the opposite side walls. 5 drawing figs.

371. Kurz JC

IMPROVEMENTS IN OR RELATING TO FIRE DAMPER UNITS

UK Patent No. 1,427,844; Cl A5A 22, (A62C 3/14), Appl 18 Apr 1973, Discl. 10 Mar 1976, Assignee: Author

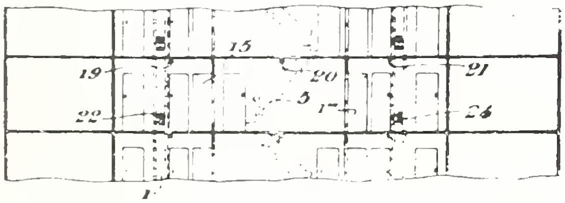
According to the present invention there is provided a fire damper including a peripheral frame having a blade guide channel, a blade assembly movable within the channel from an open to a closed position, a spring-and-clip assembly affixed in the frame in position to coact with the blade assembly, the spring-and-clip assembly including a spring having a portion connected to the blade assembly, the spring continuously biasing the blade assembly to closed position to lock space for the leading edge of the blade assembly between the locking finger and the blade-guide channel and locking means provided in the blade assembly adaptable to engage the locking finger when the blade assembly is in the closed position to prevent it from opening. A fusible link melts under heat to release the blade assembly. 10 claims, 6 drawing figs. (Author)

372. Moss CH

IMPROVEMENTS IN OR RELATING TO FIRE SAFETY SYSTEMS

UK Patent No. 1,438,001; Cl A5A, (A62C 3/00), Appl 26 Jun 1973, Discl. 3 Jun 1976, Assignee: KG Smoke Dispersal Ltd, Storrington, UK

A patent is disclosed for a fire safety system to be used in a residential building having a number of compartments and interior common access spaces (halls, vestibules, stairways). The system includes a number of smoke detectors in the access spaces which detect smoke in the various sections, actuate a pressurized-air ventilation system and self-closing fire-stop doors to isolate the affected section. The doors are held open under normal conditions by electro-magnetically controlled locks, which are in turn controlled by the smoke detectors. The interior access spaces are vented through and around the windows in the exterior walls or by means of uni-directional ventilators in the compartments exhausting air and smoke to the exterior of the building. 5 drawing figs.



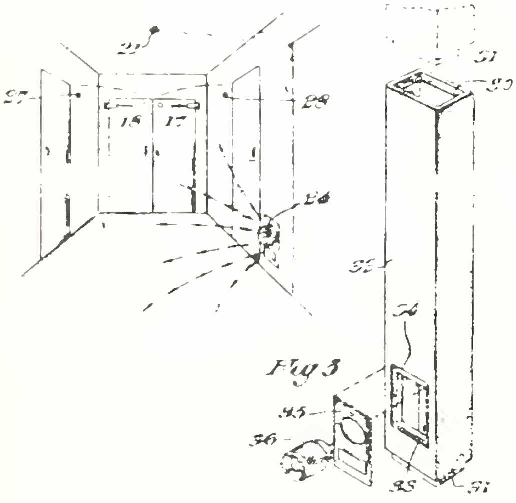


Fig 3

373. Moss CH

IMPROVEMENTS IN OR RELATING TO FIRE SAFETY SYSTEMS

UK Patent No. 1,438,002; Cl A5A, (A62C 3/00), Appl 26 Jun 1973, Discl. 3 Jun 1976, Assignee: KG Smoke Dispersal Ltd, Storrington, UK

This invention relates to fire safety systems for clearing smoke from multi-story buildings during fires, particularly from interior common access areas such as halls and stairways. The normal air-handling shafts are used for this purpose. Fans associated with vents on each floor are controlled by smoke detectors in the common-access interior passages. In response to the detection of smoke on any floor, the fan associated with the vent opening on that floor is reversed so that it expels air from the shaft to the affected floor, forming a pressurization system.

374. Schubeis EIE

DOOR FRAME, ESPECIALLY FOR FIRE-PROOF DOORS

UK Patent No. 1,439,394; Cl E1J 211, (E06B 1/20), Appl 1 Nov 1973, Discl. 16 Jun 1976, Assignee: Author

This invention relates to a door frame, especially but not exclusively meant for fireproof doors. The door frame covers the edge sides of a door opening in a wall and consists of two frame portions, each made from a strip of sheet material bent into a substantially L-like cross-section having a first and second leg, the frame portions being arranged in a door opening in a wall in such a way that the first legs of the frame portions engage the opposite outer surfaces of the wall around the door opening and that the second legs of the frame portions extend into the door opening substantially parallel with the edge side with the opening and overlap each other within the door opening.

375. Dietrich RJ

WALL (FIRE-RESISTANT)

US Patent No. 3,983,672; Cl 52/238, (E04B 2/06), Appl 21 Nov 1973, Discl. 5 Oct 1976, Priority: FRG, Appl. No. 2116578, 5 Apr 1971

A wall constructed with several layers to form a fire resisting and thermally insulating unit is disclosed. In one form the unit is formed with a central steel supporting layer on either side of which insulating panels are fixed; this is then clamped in a top and bottom bracket for securing to a floor and ceiling; facing panels are then secured onto the assembly. In a further form there are two steel reinforcing layers and an insulating layer as a core in between the supporting layers; the panels can be assembled for use as no-load-bearing exterior walls or partitions. 28 claims, 1 drawing fig. (Author)

376. Imperial RE, Schultz EG, Jr and Hull GS

METAL DOOR ASSEMBLY AND METHOD OF PRODUCTION

US Patent No. 3,987,588; Cl 49/501, (E06B 3/16), Appl 3 Apr 1975, Discl. 26 Oct 1976, Assignee: Johnson Sheet Metal Works Corp, Richmond, IN

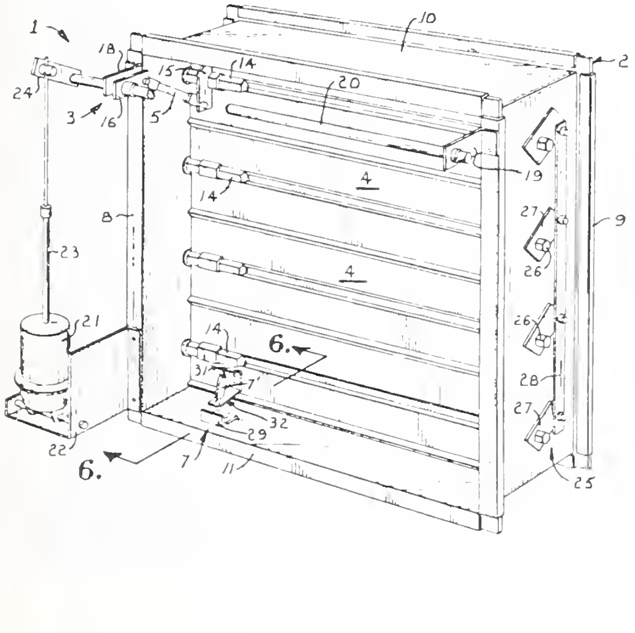
A formed sheet metal rectangular-shaped frame is positioned between two sheet metal side panels which may be embossed to provide the appearance of small wood panels. The frame includes an elongated frame member for each edge of the door, and each frame member has two outwardly facing parallel-spaced channel portions integrally connected by a center web portion. Extruded plastic trim members cover the top and side frame members and include longitudinally extending hook-shaped leg portions which project into the channel portions and snap-fit onto inwardly formed edge portions of the side panels. A foam insulation material is expanded between the side panels and also serves to space the side panels laterally from the frame to form a thermal barrier. The side trim members are interrupted or notched to receive the door hinges and a latch bolt housing which sit on the web portions of the corresponding frame members. A generally U-shaped elongated door seal is secured to the frame member which extends along the bottom of the door. The frame is preferably constructed in two opposing generally C-shaped sections which are expanded to receive the edge portions of the side panels before the foam is inserted, and a block of more dense insulation material is placed between the side panels adjacent one of the frame sections for attaching a door lock set. 17 claims, 15 drawing figs. (Author)

377. Root JR

CONTROL DAMPER

US Patent No. 3,996,952; Cl 137/77, (F16K 17/38), Appl 18 Sep 1975, Discl. 14 Dec 1976, Assignee: Ruskin Mfg Co, Grandview, MO

A control damper is mounted in a building duct system for closing a control opening through a housing or frame and includes a linkage connected to the housing and to a vane positioned in the control opening and is operative for moving the vane between a flow-permitting position and a position closing the control opening. The linkage includes a fusible portion permitting a resilient member to move the vane to the position closing the control opening in the event of temperature above the melting point of the fusible portion. Cooperating latch members are mounted on the housing and on the vane and are moved into vane holding engagement after melting of a fusible portion and movement of the vane to the position closing the control opening through the housing. 7 claims, 10 drawing figs. (Author)

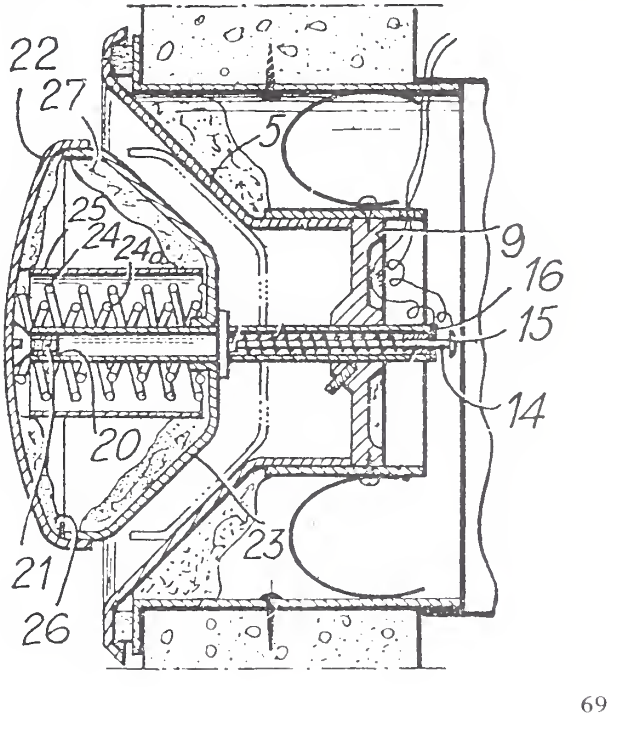


378. Strulik WP and Mealares C

FLAME-ARRESTING OR SMOKE-CLEARING VALVE DEVICE OPERATING BY CLOSURE AND OPENING RESPECTIVELY

US Patent No. 3,981,317; Cl 137/75, (F16K 17/38), Appl 3 Feb 1975, Discl. 21 Sep 1976, Priority: France, Appl. No. 74.04607, 12 Feb 1974

The valve device adjustably controls air flow through a mechanical ventilation duct, blocks propagation of flames through the duct, and selectively exhausts smoke through the duct. An air extraction terminal sleeve communicates with the ventilation duct and is provided with an outwardly facing valve seat. A support is mounted in the sleeve inwardly of the valve seat and an elongated guide extends adjustably through the support. An obturator is mounted on the guide outwardly of the support for adjustably controlling the flow area into the terminal sleeve, and includes an outwardly convex dome member fixedly secured to the outer end of the guide, and an inwardly convex valve member having conforming seating engagement with the dome member and arranged to conformingly engage the valve seat to block flow into the



terminal sleeve. The valve member is slidable on the guide, and a pair of oppositely wound coil springs surrounds the guide within the obturator and biases the valve member to separate from the dome member to engage the valve seat. A pin engaged with the guide restrains separation of the dome and valve members and releases such restraint responsive to detection of a fire whereby the valve member is disengaged from the dome member to engage the valve seat to block the terminal sleeve. The interior surfaces of the dome and valve members are lined with insulating layers, and the valve member has apertures therein covered by the associated insulating layer. By removal of this insulating layer and disengagement of the pin, the valve member may be separated from the dome member so that smoke may be exhausted through the duct. 7 claims, 7 drawing figs. (Author)

379. Benjamin IA, Fung FCW and Roth L
CONTROL OF SMOKE MOVEMENT IN BUILDINGS: A REVIEW. Nat Bureau Standards, Inst Appl Technol, Center for Fire Res; NBSIR 77-1209, 39 pages, 1 fig, 1 table, 62 refs, Jul 1977
Availability: NTIS

A state-of-the-art review of efforts in smoke movement and smoke control is presented. Basic principles, experimental techniques and results, computer models, and smoke control methods that have been employed are presented. The paper covers all work in the area of smoke movement and smoke control, but emphasizes the work of NBS. (Author)

380. Fung FCW and Zile RH
TEST AND EVALUATION OF THE SMOKE CONTROL CAPABILITIES OF THE SAN DIEGO VETERANS ADMINISTRATION HOSPITAL. Nat Bureau Standards, Inst Appl Technol, Center for Fir Res; NBSIR 77-1225, 160 pages, 55 figs, 34 tables, 27 refs, Apr 1977

A study was made by the National Bureau of Standards to evaluate the smoke control capabilities of the San Diego Veterans Administration Hospital. A unique feature of the hospital is the presence of independent air-handling units for each floor and each wing. This feature allows the air-handling units to be manipulated for smoke control following the systematic pressurization concept. Systematic pressurization is a means of smoke control whereby a building is divided into either vertical or horizontal compartmented zones such that the air-handling systems are designed to exhaust the immediate fire zone and pressurize the adjacent surrounding zones upon detection of smoke. An experimental technique of smoke simulation and smoke movement measurement was used for the study. The effectiveness of the systematic pressurization smoke control concept is demonstrated by the simulated smoke concentration profiles and pressure measurements. An extensive series of experiments designed to evaluate the above smoke control concepts was performed by the NBS in cooperation with the VA. Two types of experiments were performed with the building air-handling system operating in normal and various smoke control modes. First, simulated smoke infiltration measurements were obtained by using the sulfur-hexafluoride smoke simulation technique. Second, pressure measurements were obtained across elevator doors and doors leading from the building central core to each wing. Both SF_6 concentrations and pressure measurements are key indicators of smoke movement in this evaluation. Six basic air-handling test configurations were established and pressure difference data were collected at 15 locations on each floor measured. At least two floors and more generally three floors were measured for each mode. Each of the six configurations tested is summarized in table 7, and the measured data are summarized in table 8. Six smoke simulation experiments were conducted. The results and test conditions for each test are tabulated in tables 1 and 6, inclusively. It is concluded that air-handling systems in the San Diego VA Hospital can be effective in controlling smoke movement if the proper vertical and horizontal systematic pressurization concept as described in this report is applied. A computer smoke movement simulation analysis is also presented. Computer calculations compared favorably with field data. Parametric analysis was also performed on smoke control modes for varying environmental and leakage conditions to further study the smoke control uses of the air-handling system and to demonstrate the capability of the computer simulation program. (Author)

i. WATER SUPPLIES

6. FIRE SAFETY

a. AGRICULTURE AND WILDLANDS

[For more complete coverage of the forest fire literature see ***Forest Fire Control Abstracts*** (Canada).]

b. COMMERCIAL OCCUPANCIES

381. Cascarino A
FIRE PROTECTION PROBLEMS IN HIGH-RACK WAREHOUSES
Antincend Protez Civ; 28(5):339-342, 1976 (Italian)

Extinguishing fires in high-rack warehouses is a serious problem. In view of the large spaces, CO_2 and high-expansion foam fire extinguishing systems are not particularly effective. It is also not expedient to use powder. The most reasonable fire-extinguishing agent is water, which not only has an extinguishing effect, but also cools the steel components of the racks. It was originally planned to install sprinkler networks along the ceiling of high-rack warehouses, but this turned out to be an unsatisfactory solution. Then it was decided to arrange the sprinklers in a more effective multi-level system of networks, so that they could water down the entire height of the stacked materials. At the present time sectional drencher networks are being used with greater frequency, because sprinklers are largely delayed-action fire detectors. (RZh)

382. Sakaki T
FIRE DEFENSE SYSTEM IN DEPARTMENT STORES
Densetsu Kogyo; 22(11):12-16, 1976 (Japanese)

Statistical data are cited for the period 1962 through 1975 characterizing the number of fires in large department stores and shopping centers in Japan, the causes of fires, the nature and features of their development and extinguishment, and also the magnitude and nature of the losses. These aspects are considered in detail for several specific typical cases. The design, siting principle, operation, and the basic tactical and technical parameters of several complex automatic fire alarm and extinguishing systems developed for operational conditions in large shopping centers are described. The principal technical requirements for such systems are presented. It is pointed out that the main difficulty facing the introduction of these fire safety systems is the fact that only a few of the large shopping centers and department stores being built and operated in Japan have been developed according to unified standard building plans. The greater number (80%) of these establishments was designed and built according to individual plans. It is only natural that in the absence of uniform design standards, it is difficult to introduce mass-produced complex fire-safety systems characterized by comparatively sophisticated design features and requiring extensive installation and adjustment work. Conclusions are drawn and recommendations are given for a sharp limitation of the construction of nonstandard commercial establishments of this kind. 3 figs, 3 tables. (RZh)

383. Joseph J
DIESEL FIRE PUMPS PROTECT ALASKAN OIL
Diesel Gas Turb Progr; 42(8):22-23, 1976

The prime fire protection for the 32-unit storage tank farm at the Port of Valdez, Alaska, will be supplied by seven diesel fire pumps (10,000 gpm of water), three on duty and four standby. Technical characteristics, operational features, and installation are described. 4 figs.

384. Anon
SEVEN-POINT MANAGEMENT PLAN FOR FIRE-SAFETY IN HIGH-RISE BUILDINGS
Fire Prev; (119):16-21, 1977

The special responsibilities of the management of a high-rise building, both owners and occupiers, to ensure the safety of all occupants from fire reduce to the measures embodied in a seven-point plan outlined in this article. The plan covers the following seven points: 1) establishment of a fire safety committee; 2) appointment of a fire safety officer; 3) appointment of fire wardens; 4) drawing up plans of the building; 5) preparation of a fire prevention maintenance program; 6) establishment of a fire control center; and 7) preparation of a fire emergency plan. A fire prevention maintenance program chart outlines daily, weekly, monthly, quarterly, semi-annual, and annual actions to be taken.

385. Anon
FIRE PROTECTION IN WAREHOUSES
Lager; 12(6):8, 1976 (German)

Powder fire extinguishers are needed to extinguish fires in storage areas, especially in the early stage. This type of fire extinguisher contains up to 12 kg of powder and a compressed-gas cylinder. A specific type of fire-extinguishing powder is used, depending on the fire class. 1 fig. (RZh)

386. Yamashita S
SAFETY SYSTEM EQUIPMENT FOR REFRIGERATED WAREHOUSES
Reito Kucho Gijutsu; 27(317):101-114, 1976 (Japanese)

A block diagram, the design and operating principle of a complex, automated self-blocking and fire-safety system designed for use in refrigerated food-product warehouses are described. Since the products are quick-frozen and refrigerated at temperatures down to −40°C, the specific features of this system consist in a fire-detector temperature range that is shifted somewhat relative to ordinary fire-safety systems and equipment. The comparative technical parameters of mass-produced fire detectors with operating ambient temperature ranging from −10 to +40°C and of a detector developed especially for this system and designed to operate at temperatures of the ambient medium (air or solid surfaces) ranging from −50 to −10°C are given. The safety system includes a branch line from the common water-supply network with local water heating, a stand for the centralized safety control system located in a special area and equipped with an indicator panel, a fire-detector network, a network of foam fire extinguisher heads, a high-expansion mechanical foam generator, an actuator loop for supply of foam concentrate, a compressed-air supply system, a foam-concentrate proportioner, and an emergency visual and acoustic alarm circuit. Also presented are the results of operational tests of the system. 27 figs, 2 tables. (RZh)

387. Jensen RH [*Rolf Jensen and Associates Inc, Deerfield, IL*]
FIRE PROTECTION SYSTEMS IN WATER TOWER PLACE
Specifying Engr; 37(7):60-65, 1977

The fire protection and life-safety systems for Water Tower Place, Chicago (74 floors above ground, 4 floors below ground level), were planned to accomplish life safety for all occupants, functional continuity for the respective building uses, equivalent compliance with applicable codes, and cost effectiveness. The specific fire protection systems were selected by using decision analysis (or decision-tree) methods to achieve the best combination of fire-safety features to meet these goals. Systems responsive to the operational needs of each of the five identifiable building operating-ownership units were provided: 1) condominiums – floors 33 to 72; 2) hotels – floors 14 to 31; 3) main mechanical and hotel service – floors 10 and 11; 4) office – floors 8 and 9; and 5) mercantile area – floors 1 to 7. Also provided for are the below-grade areas used as shipping/receiving, parking, and miscellaneous mechanical spaces. Sprinkler, standpipe, emergency power, smoke control, and operational sequences are described. 6 figs.

c. ELECTRICAL

388. Viger R
FIRE PREVENTION
Allo 18; (318):34-40, 1976 (French)

A seminar on "Fire Protection of Computer Centers" sponsored by the Belgian Society of Economics and Applied Mathematics was held on May 19, 1976, in Belgium. In a paper presented by the representative of the Paris Fire Brigade, statistics on fires in France, the main aspects of fire theory, and firefighting problems were considered. The combustibility classification of materials and fire resistance of building structures used in France were presented. The main features of the fire hazard of computer centers were enumerated, such as the presence of a large amount of paper and plastics, the presence of floor voids, and the use of suspended ceilings. The regulations which must be observed in various premises are cited. Possible methods and systems of automatic fire detection and extinguishing are proposed, gaseous extinguishing systems being given preference. It is noted that fire detection and extinguishing must be self-contained in the following zones: sub-floor voids, the enclosure area, and in the area above a suspended ceiling. Duplicates of especially important information documents are recommended, and they should be stored in other buildings. 2 tables. (RZh)

389. Anon
POLYCARBONATE INSULATING FOILS REDUCE FIRE RISK
Maschinenmarkt; 82(104-105):2027, 1976 (German)

Electrical insulating foils made of modified polycarbonate which meet the rising fire-safety requirements for electrical insulation are described in brief.

390. Ishikawa M
INSPECTION CHECKING OF THE FIRE STATUS OF ELECTRICAL EQUIPMENT IN PETROCHEMICAL PLANTS
Ohm: Denki Zasshi; 63(10):46-51, 1976 (Japanese)

On the basis of the example of individual types of electrical equipment of petrochemical plants an analysis is made of the most effective and rational methods of monitoring the status of fire safety of this equipment. Also given are some recommendations for improvement of the organizational structure of monitoring agencies. The classification of facilities and premises by fire and explosion hazard presently in effect in Japan is also presented. For example, premises containing liquids (in storage or operation) with a flash point above 450°C, especially storage areas for mineral oils etc, belong to group S-1; premises in which a suspension contains a combustible particulate, but not explosive, belong to group S-2; premises containing solid fire-hazardous combustible substances and materials, especially paper, fabrics, and lumber, belong to group S-3; and premises containing combustible liquids with a flash point above 45°C belong to group S-4. The explosion-hazard criterion takes in an additional classification in six basic groups for various types of manufacturing and storage premises. For example, premises in which explosive substances and materials may form under normal operating conditions belong to group E-1; premises in which explosive situations can arise only as a result of some kind of accident, etc, belong to group E-2. Recommendations are made as to the most rational choice of permissible electrical machines, apparatus, wiring, and other electrical equipment for premises belonging to the different categories. 4 figs, 8 tables. (RZh)

391. Sakamoto M, Ikenaga Y, Miyazu T and Inoshita M
LEAK ALARM DEVICE, MODEL AGD-N
Omron Tech; 16(2):111-122, 1976 (Japanese; English Summary)

The electrical circuit, design and technical parameters of an automatic, all-purpose alarm, model AGD-N, are described. The alarm was developed in 1975 by the Omron Tateishi Electronics Company (Japan) to warn of leakage in electrical communication systems. The device is based on measurement of the electrostatic bias current produced when the insulation breaks down, when there is an abrupt drop in resistance of the insulation in case of high humidity, or when other faulty conditions arise. This principle makes the leak-protection device all-purpose and, consequently, it can be used in combination with almost any electrical communication system and electrical installation. The technical parameters of the AGD-N are given in comparison with the corresponding parameters of a new model, AGD-U, now being developed. This model is operated by a d-c voltage network of 100/200V, 50/60Hz, initiating a signal to the siren of 30 mV with an amplitude of 50 mA. The new model AGD-U makes it possible to monitor the leakage at a large number of points. The level of the emergency signal developed by both models is not less than 75 dB. 11 figs, 3 tables, 3 refs. (RZh)

392. Barge J, Calle R, Chapelet G, Ai B, Dejean P, Huraux C and Mayoux C
INSULATING MATERIALS TO SUPPRESS PARTIAL ELECTRICAL DISCHARGES
French Patent No. 2,275,859; Cl H01B 3/18, Appl 21 Jun 1974, Discl. 16 Jan 1976, Assignee: ANVAR, France

The invention relates to electrical insulations made of macro-molecular materials with improved performance, especially with regard to partial discharges, which bring about eventual erosion of the insulating materials. The macromolecular compound forming the base of the insulating material incorporates a metal chelate derived from an organic compound in a quantity sufficient to suppress electrical arcing. No drawing figs.

d. INDUSTRIAL OCCUPANCIES

393. Belinchon DN
FIRE PREVENTION IN THE HYDROCARBON INDUSTRY
ASELF; (56):43, 45, 1976 (Spanish)

The extinguishment of fires in oil- and gas-treatment plants requires the concentration of large forces and means and is a complex technical task. For this reason, serious attention must be paid to fire prevention in these plants in all stages of production. Pipelines and hydrants must be inspected periodically. Fixed extinguishing systems must always be kept in a working state. Also of great importance is the training of the technical staff in methods of eliminating accidents and suppressing fires with the primary fire-extinguishing means. A reduction in the number of fires will also be advanced by ensuring fire-safe conditions when carrying out maintenance and repair work in these plants, during which fires often break out. (RZh)

394. Briers E [*Assoc Nat pour la Protect Contre l'Incendie, Belgium*]
PRACTICAL METHODS OF ORGANIZING FIRE DETECTION AND ALARM IN PLANTS
Brass Malt Europe; 26(6-7):126-128, 1976 (French)

The fire protection steps for a plant, aside from the usual prevention measures, consist in: 1) defining the area to be protected, such as building plans, accesses, environment, hot spots, both inside and outside, and number of building occupants; 2) compiling an inventory of the existing means of protection, such as detectors, reels, extinguishers, exits; and 3) drafting an organizational plan, that is, defining what is required of each person in case of warning and alarm. Once the plan has been worked out, it is tested by realistic exercises and, if required, modified. The plant personnel are indoctrinated and teams are formed for maximum use of the existing means. The plan is implemented by diagrams (decision trees) and the drafting of general and special instructions, summarizing the different actions and means to be applied successively in fighting the fire. 3 figs.

395. Anon
PLANT MANAGEMENT AND FIRE SAFETY
Face au Risque; (126):25-31, 1976 (French)

Once again the CFPA attempts to arouse a sense of responsibility on the part of plant management for fire safety because lives and property are at stake. For this reason, managers must be aware of the risks, must be able to evaluate, assess and handle them. An organization plan for areas of responsibility assigns tasks to directors, safety officials, department managers, plant managers, fire brigades, and personnel. A check-list outlines the area of responsibility of management. The codes valid in France for the protection of residential and public-access buildings, factories, shops, offices, adjacent properties, and highrise buildings are cited. 5 figs. (Fachdok 13/0546)

396. Anderson J
NORTH SEA OIL SAFETY
Fire Eng J; 37(106):31-32, 1977

Since the first flow of crude oil from British Petroleum's Forties Oilfield in the North Sea, production has exceeded estimates. The development of Britain's first major oilfield, especially the pipeline system, gas separation at the Kinneil gas/oil separators, the Dalmeny crude oil storage area, the Hound Point Island terminal, and the fire protection measures (water supplies, firefighting equipment, firefighting tips), are described, along with the involvement of the Lothian and Borders fire brigade in operational planning with British Petroleum and the Forth Ports Authority. 2 photos.

397. Renowden DG [*Leyland Cars Ltd, UK*]
SAFETY IN HEAT TREATMENT PLANTS
Fire Eng J; 37(106):17-21, 1977

Discussed in this second part of the article are the process which involves the subsequent cooling of the component (cooling media, stages of cooling, characteristics of media, oil fire conditions, tank design, and dangerous practices) and the fire protection measures that can be taken for the plant and process as a whole, which reduces to planning for fire safety as an integral part of the basic design, backed up by fixed extinguishing systems to protect specific hazards, adjacent equipment, and building structures. The article concludes with a heat-treatment hazard monitoring checklist.

398. Renowden DG [*Leyland Cars Ltd, UK*]
SAFETY IN HEAT TREATMENT PLANTS
Fire Eng J; 37(105):33-36, 1977

Considered in this paper are the combined features involved in the heat treatment of metals, a unique fire and explosion risk. The problem arises from the combination of high temperatures, combustible and explosive atmosphere gases and oil quenchants, which require design within carefully planned parameters. This first part of the two-part article describes the process itself and the furnace, the operation and design sections of which are dealt with separately as heating, combustion safeguards, temperature control, special atmosphere, operating safeguards, operating procedures, and dangerous practices.

399. Anon
THE PRACTICE OF USING EXPLOSION-SAFETY SYSTEMS
Keiso; 19(11):65-70, 1976 (Japanese)

An analysis is made of some organizational and technical aspects of the use of automatic explosion-safety systems; also determined are the principal ways of increasing the fire and explosion safety of a number of production processes. It is noted that for a more effective evaluation of the fire and explosion safety of high-capacity technological apparatus, it is necessary to develop a unified method of calculating the probability of accidental spillage of combustibles when apparatus are damaged or involved in accidents. The aftereffects of such accidents must be taken into account by a system of indicators, such as the quantity of material spilling out of the apparatus, the fire and explosion safety indexes of this material, the temperature and pressure in the apparatus, and the location of adjacent apparatus, buildings, and other facilities. The industrial explosion prevention systems used in Japan are based primarily on timely depressurization of the apparatus by means of safety membranes, valves, and also special plugs which destruct or open to relieve the excess gas pressure. Such systems are used for technological apparatus with a comparatively low operating pressure of the gas-, particulate- and vapor-air mixtures (not more than 1.5 MPa). At higher pressures highly effective explosion-prevention systems are used, having a controlled depressurization process whose operating principle is based on the automatic opening of an emergency aperture until the pressure in the apparatus reaches a certain predetermined threshold value. (RZh)

400. Irinina TI, Ivanov VN, Chulkova AD and Kurochkina MA
FIRE AND EXPLOSION SAFETY OF INVESTMENT CASTINGS
Liteinoe Proizvod; (5):35-36, 1976 (Russian)

Recently, a trend has been noted to use investment castings with binders obtained by hydrolysis of ethyl silicates without organic solvents. One of the most important advantages of this process is the reduction of the fire and explosion hazard of the compounds being used. But some researchers also consider these castings as being fire and explosion hazardous because the ethyl silicate without organic solvents releases ethyl alcohol during hydrolysis. Considering the importance of this question for existing and planned shops and castings, a study was made to determine the flash point of various makes of ethyl silicate, binding solutions and suspensions. The research showed that castings in which organic solvents are used and warehouses are fire and explosion hazards with flash points ≤28°C; warehouses and storerooms for ethyl silicates 32, 40 and 52 and monoesters of orthosilicates are fire and explosion hazards with a flash point of 28-61°C; castings using an ethyl silicate binder without organic solvents containing >35% ethyl silicate had flash points of 28-61°C; castings using binding materials such as liquid glass, colloidal silica, an emulsion binder with a base of ethyl silicate 52 and an "aqueous" hydrolyzed ethyl silicate in a concentration of up to 35% in the liquid phase have the lowest fire and explosion hazard. 3 figs, 4 refs.

401. Hilton JD [*Mather and Platt, Fire and Security Group*]

FIRE PROTECTION FOR THE OFFSHORE INDUSTRY

Pet Rev; 30(360):655-656, 1976

The overall strategy for protection of offshore oil drilling platforms is the extensive use of sea water. The wellhead and process rooms are protected by a spray deluge system. Flammable liquid fires involving the heavier oils are fought with high-velocity water installations designed to apply water, under pressure, in a reasonably uniformly divided spray of broken streams. Automatic protection against fires involving gases and the lighter oils is provided by equipment that detects fires in the early stages and concentrates on preventing fire spread and protecting structures and rigging. Automatic sprinklers and fire alarm installations provide security in other platform areas such as workshops, utility rooms, storage and walkways. External walls of living quarters overlooking fire-hazard modules are fitted with water spray curtains; halon gas and carbon dioxide are used in specific applications in generator turbines, switchgear and battery rooms. Foam/water installations are provided for helidecks and process areas. Automatic extinguishing installations are actuated by sophisticated fire detection systems. Fire protection installations are planned and incorporated in the initial stages of platform design and construction.

402. Anon

SOME PROBLEMS IN THE AREA OF FIRE PROTECTION OF BUILDINGS IN THE FURNITURE INDUSTRY. PART 1

Przem Drzew; 27(11):10-12, 1976 (Polish)

The fundamental concepts and definitions in the areas of fire standardization are given: fire and explosion hazard, fire and explosion hazard categories, fire load, fire endurance, etc. Premises, zones and spaces are classified by fire and explosion hazard into five categories each. The characteristics of each category are listed in tables. Furniture producing plants belong to the third fire-hazard category, except for finishing shops and departments, where varnishing, grinding, and cementing of decorative pieces are handled; these areas have explosion hazards. A list of standards and technical literature on aspects of fire and explosion safety is provided. 2 tables, 50 refs. (RZh)

403. Anon

FIRE SAFETY INSTRUCTIONS FOR PETROCHEMICAL PLANTS

Sekiyu Shiryo Geppo; 21(8):606-608, 1976 (Japanese)

Instructive materials on fire safety in the operation of fixed storage tanks for petroleum products with a volume of 10 million plus liters are outlined. According to the new fire legislation, which went into effect in Japan on 1 January 1976, these tanks must be equipped with floating steel roofs, which reduce appreciably the gas-air space above the liquid and, consequently, reduce the fire hazard. Data are presented to illustrate the effectiveness of floating steel roofs. In particular, these tanks make it possible to reduce the evaporation losses of petroleum products by a factor of 4-5 compared to the losses of these liquids when they are stored in ordinary vertical cylindrical tanks. The losses from evaporation are reduced because the floating roofs reduce the surface area of the petroleum product in the tank by almost 90%. It is especially effective to use these tanks to store petroleum products with a specific weight of 0.47-0.9 t/m^3 under normal atmospheric pressure. Also given are recommendations on the optimum (from the fire safety viewpoint) spacing of tanks and other auxiliary and production equipment used in petrochemical plants and in depots for fire-hazardous petroleum products. A diagram is given of the location of the principal petrochemical plants in Japan. 1 fig, 3 tables. (RZh)

404. Wakabayashi K

FIRE AND EXPLOSION PREVENTION ENGINEERING

Soda to Enso; 27(6):183-200, 1976 (Japanese)

Analytical calculations performed by the queuing method make it possible to establish a one-to-one relationship (using the resultant mathematical formulas) between several statistical reliability factors governing the fire safety of constituent components, complex devices and technological processes in industry. In particular, relationships are established (in analytical and graphic form) between the fire safety level of complex devices and technological processes as a function of the statistical probability of fire originating in constituent components and the fire hazard of individual technical operations, respectively. 11 figs, 4 refs. (RZh)

405. Razdol'skiy LG [*VV Kuybyshev Moscow Construct Eng Inst, USSR*] and Chernov YuT

EXPLOSION SAFETY PROBLEMS OF INDUSTRIAL BUILDINGS. STRESSES AND CALCULATION OF BUILDING STRUCTURES

Stroit Mekh Raschet Soor; (2):9-16, 1977 (Russian)

Considered in the first part of this survey article is the literature devoted to general aspects of the explosion safety of industrial buildings, the physics of combustion of gas-vapor-dust-air mixtures, and the effects of explosive products on building structures. Examined in the second part is the literature devoted to experimental and theoretical studies of building components subjected to strong dynamic effects with allowance for the inelastic stage of deformation of structures, as well as to the performance of materials and samples at high rates of deformation. 64 refs.

406. Schoenherr J

PROBLEMS OF PERSONAL HEAT PROTECTION IN PLANTS WITH FIRE AND EXPLOSION HAZARDS

Tech Ueberwach; 18(5):173-177, 1977 (German)

The aim of this paper is to study the problem of "humanizing working conditions." Laborers in hazardous worksites not yet manned by "robots" must be protected by suitable measures. The problems of personal heat protection in plants with fire and explosion hazards are discussed. Hazardous worksites in refineries and similar facilities, in plants for the production of aluminum-alkyl compounds, and in plants of the explosives industry are investigated. Special clothing is commercially available except for plant work areas with explosives hazards. Therefore, the developmental work for tailor-made protective clothing to meet the particular requirements of work areas in the explosives industry is described. 11 figs, 15 refs. (Author)

407. Buehrer P
CHECK LIST FOR THE PREVENTION OF FIRES ARISING FROM WELDING AND ALLIED PROCESSES
Weld World; 14(5-6):122-125, 1976 (English and French)

Advice on how to prevent fires arising from welding and allied processes, such as cutting, heating, burning, brazing and smoldering, is given in the form of a questionnaire with recommendations provided.

408. El'natanov AI, Strizhevskiy II, Grinberg ShL, Mankin AN and Sidorenko YaB
FLAME ARRESTER
USSR Patent No. 497,023; Cl A62C 3/04, Appl 11 Jan 1974, Discl. 5 May 1976

The patent relates to devices for the prevention of flame flashback and can be used in the chemical, petrochemical, mining, and oil branches of industry. The flame arrester consists of a housing with inlet and outlet pipes, a heat-sensitive element, and a flame arresting unit in the form of a gas-permeable plate with spring-driven pin and a valve at the end of the pin designed to increase the speed of response of the arrester assembly. When the heat-sensitive element is deformed by the flame, it releases the pin, driving the valve into the outlet.

409. Kvasha NV, Bersenev BP and Asnis PM
COMBUSTION STABILIZER
USSR Patent No. 503,267; Cl G08B 17/12, Appl 17 May 1975, Discl. 2 Apr 1976

The stabilizer contains an ionization electrode connected to a limiting resistor and a condenser coupled to the input of a three-cascade amplifier, to the output of which is connected a relay with terminals associated with signal lamps. In order to increase the operating reliability of the alarm, it contains a diode, an avalanche diode, a thyristor and a supplementary resistor series-connected to the limiting resistor, whose cathode is coupled to the condenser and the input of the three-cascade amplifier. The emitter of the transistor of the next-to-last cascade is connected to the avalanche diode, which is associated with the control electrode of the thyristor, the cathode of which is connected to the signal lamp coupled to the closing terminal of the relay.

410. Strizhevskiy II, Zakaznov VF, Gavrilin VP, Fedotov VG and Kukoev YuA
FLAME ARRESTER
USSR Patent No. 511,954; Cl A62C 1/00, C10H 21/08, Appl 27 Jul 1972, Discl. 10 Jun 1976

The invention relates to a housing with connecting branches filled with a refractory material. In order to increase the reliability of localizing a flame, the housing is made in the form of an elbow with an anti-detonation screen in the branchings and a check valve plugged in the upper position, the void between the valve and the filling being connected with the flame-extinguishing-liquid container via a duct provided with a shut-off unit kinematically connected with the valve.

e. INSTITUTIONAL OCCUPANCIES

411. Anon
AUTOMATIC SPRINKLER EXTINGUISHERS FOR HIGHRISE BUILDINGS
Antincend Protez Civ; 28(2):124-125, 1976 (Italian)

In view of several cases of fires in highrise buildings that claimed human lives, it is considered necessary to install automatic sprinkler fire-extinguishing systems, especially if these buildings are of the public-access type (hospitals, office buildings, etc). (RZh)

412. Pickeral WH
A GUIDE TO HOSPITAL FIRE PROTECTION SYSTEMS
Build Syst Des; 73(2):31-37, 1976

Discussed is the fire protection system for the Gretna Community Hospital, Fairfax County, VA, as shown on a view diagram. The interest is to help the plumbing engineer who is new in the field of hospital design and engineers who have not designed a hospital plumbing system in recent years. All the specific aspects of the system, including joints, water pipe laying, sprinkler and standpipe systems, valves, piping work, hangers and supports, sprinkler heads, motor-driven fire pumps, and jockey pumps, are described. 1 fig.

413. Penafeather JC [*Penafeather and Lee Consulting Engrs, Inc, Tulsa, OK*]
PRECODE DESIGN FOR POSTCODE OPERATION
Consult Eng; 48(6):97-99, 1977

The design problem posed by St. John's hospital, namely, to insure maximum life safety for all the building occupants, including bed patients located at the top of the new North Tower, floors 6-14, is discussed. The goal was achieved by design of proper compartmentation, surveillance, signal and communication systems, and ventilation controls, all blended into a sophisticated safe firefighting plan. Design objectives and systems are described. 5 photos.

414. Bellet H and Dussy R
PUBLIC OR PRIVATE HEALTH FACILITIES AND FIRE SAFETY
Face au Risque; (128):25-45, 1976 (French)

The following professional topics were discussed at a meeting of the CNPP (National Prevention and Protection Center) in France: areas of responsibility, structural precautions, statistical compilations, high-hazard areas, panic and evacuation, transportation, escape and rescue routes, buildings up to and over 28 meters (highrise buildings), administrative methods in building extension and reconstruction, and insurance problems. The article "Safety in Operating Buildings" discusses the design, arrangement, floor plan, and equipment of operating buildings and gives guidelines for fire prevention and protection, ventilation, emergency power, etc. The article concludes with several instructive fires in clinics at Neuilly/Seine, France, and Hartford, USA. 17 figs, 4 tables, 3 refs. (Fachdok 13/0681)

415. Wooliscraft M [*Dept Health and Social Security, UK*]
THE DETECTION OF FIRE IN OLD PEOPLE'S HOMES
Fire Eng J; 37(106):23-26, 1977

In order to determine the effectiveness of corridor detectors in detecting fires in adjoining bedrooms, theatrical smoke powder was heated on a 2-Kw electric hot plate placed in a room with a 3-Kw fan heater adding heat to the room. From this test an attempt is made at extrapolation to real fire conditions. A simple model is proposed. It is shown that the model is verified, and the model is then used to try to predict the time for a detector to operate in a real fire. The calculations suggest that, provided the assumptions of the model are correct, then where flashover time is small the time interval between detection by a detector in the corridor and flashover time is very small. This tends to lend support to the case for providing detectors in all bedrooms. 3 figs, 2 tables, 4 refs.

f. MINING

[For more complete coverage of the mining literature see ***SMRE Safety in Mines Abstracts*** (UK).]

416. Ikhno VA and Ikhno SA
ENSURING THE FIRE SAFETY OF MINE CABLE NETWORKS
Bezop Tr Prom-sti; (12):32, 1976 (Russian)

It has been found that automatic, mass-produced AB circuit breakers with the fastest response must be used to ensure the fire safety of mine cables when arcing short circuits occur in the power-supply networks in sections of coal mines in which high-dip seams are being developed. The current-limiting effect of the arc must be taken into account for correct selection of devices for the maximum current protection of these automatic circuit breakers. 2 figs. (RZh)

417. Staron T
CALCULATION OF THE SAFE THICKNESS OF THE INSULATING LAYER BETWEEN A SEAM WITH A FIRE FIELD AND A HIGHER WORKING SEAM
Pr Cent Inst Ochr Pr; 26(70):231-254, 1976 (Polish; English; French and Russian Summaries)

The author presents a method of determining the safe distance required between a seam with a fire field and a production seam lying above it. The problem is solved under the assumption that roof caving has reached a certain distance and that the insulating layer for horizontal seams requires a certain thickness. It is assumed that there is a vertical flow of gas upward through the porous medium of the shelf. A method of deriving the equation determining the height of caving for the design model of formation of the caving is given. The thickness of the insulating layer to be left between the caving rubble formed during exploitation of the seam (where the fire broke out) and the production seam above it is governed by the permissible volumetric flow of gas into the working, not to exceed $CO_{max} = 0.002\%$. Considered were: 1) the pressure and temperature differences between the seam with the fire field and the upper seam and 2) the physical properties of the rock separating the seams, taking into account fissures. To simplify the calculation, a monogram was developed and an example of application was given. With known fire field and production seam parameters, it is possible to determine the necessary layer thickness directly from the monogram. Finally, the author presents theoretical and practical results that can be used to solve the problem of exploitation of seams located above seams with active fire fields. 13 refs.

418. Johnson GA
DEVELOPMENT OF MINE SHAFT FIRE AND SMOKE PROTECTION PROTOTYPE SYSTEM
Skilling Min Rev; 65(11):1, 6-7, 1976

The FMC Corporation has been working to develop a mine shaft fire protection system. It has been found that the main source of mine fires (excluding coal mines) is electricity. The cause of fires is frequently welding and cutting work. Sometimes friction causes autoignition or ignition. The proposed system includes the following main components: heat and smoke detectors, remote-controlled smoke doors and sprinkler installations. The system provides protection for the shaft and shaft station areas. The system's surface control unit receives the fire warning signal via multiplex wiring through two separate routings. The system's underground control units are then activated from the surface to warn the miners at each shaft station. A stench system would then be activated by surface personnel to warn other miners. The sprinklers and doors can be opened or closed from either their local control unit or the master surface control unit, as can warning horns and lights and mine evacuation signals. A mock-up shaft and shaft station was built and system components tested. The cost of the system is estimated to be from $10,000 to $40,000 per shaft station level. 5 figs.

419. Lewer H
PREVENTION OF SELF-IGNITION (SPONTANEOUS IGNITION) OF COAL THROUGH THE USE OF CALCIUM OR MAGNESIUM CHLORIDE WITH ADDITION OF A WETTING AGENT
US Patent No. 3,990,517; Cl 169/45, (A62C 2/00), Appl 8 Apr 1975, Discl. 9 Nov 1976, Priority: FRG, Appl No. 2419144, 20 Apr 1974, Assignee: Chemische Fabrik Kalk GmbH, FRG

A new process has been devised for the application of a mixture of calcium or magnesium chloride and a non-ionogenic wetting agent for the prevention of the spontaneous ignition of coal, especially during underground mining operations, by applying the same to the surface of the coal. The process involves boring of holes into the out-cropping coal and then forcing the mixture of calcium or magnesium chloride and wetting agent in an aqueous solution which contains 25 to 35% by weight of the mixture through the bore holes. A constant quantity of about 3 to 6 liters of solution per min is pressed into the bore holes, the pressure being only sufficient to overcome the counter pressures occurring in the coal. The procedure greatly extends the time of effectiveness of the prevention of spontaneous ignition of the coal and eliminates to a large extent the expenditure of labor for supervision and retreatment of the surface of the coal now being experienced. 4 claims, no drawing figs. (Author)

420. Anon
SYSTEM APPLICATION REPORT: MINE SHAFT FIRE AND SMOKE PROTECTION SYSTEM. INTERIM REPORT. VOLUME I. MINE FIRE PROTECTION FOR UNDERGROUND MAINTENANCE SHOPS. FMC Corp, Engineered Systs Div, Santa Clara, CA; BuMines OFR-43(1)-77, 17 pages, Sep 1976
Availability: NTIS PB-265 070/3GA

The system application report delineates how the metal and nonmetal mine fire protection technology, developed and demonstrated during the mine shaft fire and smoke protection system contract, can be applied to underground maintenance shops.

421. Anon
SYSTEM APPLICATION REPORT: MINE SHAFT FIRE AND SMOKE PROTECTION SYSTEM. INTERIM REPORT. VOLUME II. MINE FIRE PROTECTION FOR UNDERGROUND STORAGE AREAS. FMC Corp, Engineered Systs Div, Santa Clara, CA; BuMines OFR-43(2)-77, 17 pages, Sep 1976
Availability: NTIS PB-265 071/1GA

The system application report delineates how the metal and nonmetal mine fire protection technology, developed and demonstrated during the mine shaft fire and smoke protection system contract, can be applied to underground storage areas.

422. Anon
SYSTEM APPLICATION REPORT: MINE SHAFT FIRE AND SMOKE PROTECTION SYSTEM. INTERIM REPORT. VOLUME III. MINE FIRE PROTECTION FOR UNDERGROUND FUEL STORAGE AND TRANSPORT AREA. FMC Corp, Engineered Systs Div, Santa Clara, CA; BuMines OFR-43(3)-77, 20 pages, Sep 1976
Availability: NTIS PB-265 072/9GA

The system application report delineates how the metal and nonmetal mine fire protection technology, developed and demonstrated during the mine shaft fire and smoke protection system contract, can be applied to underground fuel storage and transfer areas.

423. Lease WD
DEVELOPMENT, INSTALLATION, AND TESTING SERVICES FOR AN AUTOMATIC, POINT TYPE THERMAL SENSOR, FIRE PROTECTION SYSTEM ON A MINING DOZER. Lease AFEX, Inc, Raleigh, NC; BuMines OFR-71-77, 18 pages, Aug 1976
Availability: NTIS PB-266 075/1GA

Lease AFEX, Inc, modified its standard design of an automatic fire protection system used in the past on logging equipment, and long-term, in-mine tested system on a Fiat-Alli's HD-41B dozer at the Lemmons and Company coal mine, Boonville, Ind. The modification of the standard AFEX system involved improving the actuation device. The AFEX system is called a point-type thermal sensor, automatic fire protection system. The in-mine test took place in late 1975 and early 1976. The system was then tested by simulating a fire on the dozer. The system operated successfully after the 4 months of in-mine endurance testing. (Color illustrations reproduced in black and white.) (Author)

g. POWER PLANTS

424. Delaire M
FIRE FIGHTING IN INSTALLATIONS OF THE ELECTRIC POWER COMPANY
Luz y Fuerza; 34(419):21-31, 1976 (Spanish)

Various fire safety measures are recommended in installations of the electric power company, which include fuel storage areas, power plants, transformer substations, technical and administrative buildings, etc. These measures depend on combustible materials, their heat capacity, the specific live loading, etc. In order to avoid fire outbreak in soft coal bunkers, the coal is packed (eg, by bulldozers) and the temperature in the heap is periodically checked by means of special sensors. Oil tanks are protected by fixed foam extinguishing systems. Also provided for is wetting of the top of tanks with water from fixed systems and by monitors. The tanks are also surrounded by a bund. In case of fire in premises with propane cylinders, water drenching equipment triggered by optical fire detectors is provided to cool the premises. In steam generator premises with a natural gas supply it is recommended that fire detectors be used in boiler rooms. In electrical equipment areas the preventive measures should include the use of incombustible materials and smoke detectors, and the area should be limited to 500 m^3. CO_2 extinguishers are recommended. As a rule the fire safety of transformers is ensured by preventive measures. Fog fire extinguishing methods are advised. On the average, the cost of the fire alarm system amounts to about 4% of the total cost of the power plant. The high cost of borrowed power during the period the power plant is out of service makes it worthwhile to spend considerable funds in providing for fire protection. (RZh)

425. Anon
STANDARD REVIEW PLAN FOR THE REVIEW OF SAFETY ANALYSIS REPORTS FOR NUCLEAR POWER PLANTS. LWR EDITION. CHAPTER 9. AUXILIARY SYSTEMS: SECTION NO. 9.5.1; REVISION NO. 2. Nucl Reg Comm, Office of Nucl Reactor Regulation, Washington, DC; NTIS UB/B/201-0009-R2, 54 pages, Feb 1977
Availability: NTIS

The Nuclear Regulatory Commission's (NRC's) Office of Nuclear Reactor Regulation has published Revision No. 2 to Section 9.5.1 of the Standard Review Plan (SRP) for the NRC staff's safety review of applications to build and operate light-water-cooled nuclear power reactors. The purpose of the SRP, which is composed of 224 subsections, is to improve both the quality and uniformity of the NRC staff's review of applications to build new nuclear power facilities, as well as the quality and uniformity of information supplied by applicants as the basis for the staff's review. This revision incorporates Appendix A to Branch Technical Position APCSB 9.5-1, entitled "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976" into the Standard Review Plan.

426. Enzmann HF
INTERNATIONAL GUIDELINES FOR THE FIRE PROTECTION OF NUCLEAR POWER PLANTS. Swiss Pool for Ins of Atomic Risks, Zurich, Switzerland; ERDA-220900, 68 pages, Date Unknown
Availability: NTIS NP-20940

Guidelines are presented that have been developed by nuclear insurers for use by electric utilities when planning and installing fire protection systems.

h. PUBLIC BUILDINGS

427. Smith WI (Ed)
PROTECTING FEDERAL RECORDS CENTERS AND ARCHIVES FROM FIRE
General Services Admin, Public Buildings Service; 202 pages. Apr 1977

In mid-July, 1973, 17 million service records were destroyed when fire struck the Military Personnel Records Center in Overland, Missouri, a suburb of St. Louis. The significance of this fire is threefold: the severe structural damage to a fire-resistive building, the extensive loss of documents that protected the rights and interests of millions of citizens of the United States, and the accurate prediction, made 6 months prior to this ignition, by General Services Administration fire safety personnel of the results of a serious fire should ignition occur. Following the disaster, the Administrator of General Services appointed an Advisory Committee on the Protection of Archives and Records Centers. The Committee met during 1975, received testimony, and prepared a report. The Committee found that a substantial body of knowledge and technology (state of the art) already exists that can be and is being applied to minimize the possibility of such disasters. This report deals primarily with fire protection for records centers. With regard to structural design and storage, the Committee found that federal records centers fulfill the aims of economy and efficiency for which they were designed. The disaster potential created by the massive concentration of paper records, 100 to 160 pounds per square foot, requires that fire protection be given a higher priority than it has received in the past. The value and uniqueness of the records and the potential rapid development of fire in this high-piled situation reinforces this need. A systematic approach to fire protection is important for the planning, evaluation, and determination of the elements to be employed. The aim of records center fire protection should be threefold: 1) to minimize the possibility of fire occurring within a records center; 2) to limit the extent of fire; and 3) to minimize the destruction of records should fire occur. If prevention is unsuccessful, automatic extinguishment as soon as possible after ignition is essential. While the data base in fire protection is generally adequate to permit recommendations at this time, there are several areas that warrant further investigation in order to facilitate future decision making. (Author)

428. Anon
HOTELS AND FIRE PREVENTION
Face au Risque; (127):25-48, 1976 (French)

Hotel managers are responsible for the observance of all safety codes. Illustrative examples taken from recent hotel fires are cited in which the causes, spread, and influence of the type of structure (palace, ancient, old, recent, and highrise) are determined. The evacuation alarms and measures, the effects of heat, toxic gases and smoke, human behavior of the guests and personnel, the actions of the safety commissions, the protective and preventive measures, the civil liability of the owner, and insurance aspects are discussed in detail. Numerous figures lend insight into the details. Rooms, lobbies, and kitchens are determined to be the most frequent sites of fire outbreak. 12 figs, 2 tables. (Fachdok 13/0700)

429. Quetin M [*Direction des Archives, Paris, France*]
REGARDING FIRE PREVENTION AND PROTECTION
Gaz Arch; (92):33-47, 1976 (French)

An international symposium organized by the National Disaster Prevention Center (France) in collaboration with the Archives Directorate of France was held in Paris in November, 1975. The subject of the symposium, which was attended by 314 participants, including 77 from other European countries, was the fire safety of archives and libraries. A brief outline of the principal topics discussed at the symposium is given in the article by the technical associate of the Archives Directorate. Particular emphasis is devoted to an analysis of the contemporary status of automatic fire detection and extinguishing systems for archive buildings. Some of the books and brochures devoted to fire safety aspects of archives and libraries are reviewed in brief. Two fires that took place in archives in the USA are described. (RZh)

i. RESIDENTIAL OCCUPANCIES

430. Anon
SMOKE DETECTORS
Record; 54(3):3-7, 1977

A few simple guidelines to home fire safety are offered through the expertise of the Factory Mutual Approvals Department. The guidelines take the form of response to the prime questions: Why smoke detectors? and What are the advantages and disadvantages of each type? The necessity of maintenance is examined, and a list of Factory Mutual-approved smoke detectors is appended.

j. TRANSPORTATION (Air, Rail, Road, Water)

431. Nat Materials Advisory Board
FIRE SAFETY ASPECTS OF POLYMERIC MATERIALS. VOL 6. AIRCRAFT: CIVIL AND MILITARY
Technomic Publishing Co, Westport, CT; 257 pages, 1977

This is the 6th volume in a series. The fire safety aspects of polymeric materials are examined with primary emphasis on human survival. Other volumes in the series deal with materials; state of the art, test methods, specifications and standards, special problems of smoke and toxicity, fire dynamics and scenarios, and applications to buildings, vehicles, ships, mines and bunkers. An executive summary volume has been added to the series. A study has been made of fire safety aspects of polymeric materials used in military and civil aircraft. After a preliminary system analysis, fire incident scenarios based on actual experience (but not reproducing any single fire) were devised. The problem of human survival in case of aircraft fire was assessed in terms of materials, test methods used to evaluate materials, smoke and toxicity, fire dynamics, and design use of materials. Conclusions are drawn in each chapter and appropriate implementable recommendations made. The majority of recommendations are extracted and combined in Chapter 2. (Author)

432. Anon
FIRE PROTECTION OF SHIPS [Pozharnaya Zashchita Sudov]
Sb Tr VNII Protivopozhar Oborony; (7), 1976
VNII Protivopozhar Oborony, Moscow, USSR; 171 pages, 1976 (Russian)

This seventh issue in the series entitled "Digest of Papers of the All-Union Fire Protection Research Institute" is devoted entirely to the problem of fire safety on board ships. The 21 papers in the digest are as follows: Main Trends in Improvement of Ship Fire Safety During the 10th Five-Year Plan, by MG Stavitskiy (3-13); Analysis of the Fire Load Status of Ship Living Quarters Using Polymeric Materials, VI Martynenko *et al* (14-18); Outlook for the Development of Incombustible Materials and Compositions with Slow Flame Spread for Ship Construction, VI Vasil'ev *et al* (19-25); Ways of Improving the Effectiveness and Quality of Ship Fire Safety Structures, by MF Kortunov (26-37); Design and Use of Standard Fire-Safety Structures, by DI Korotkin (38-45); Experimental Computational Method of Standardizing the Fire Endurance of Ship Fire-Safety Structures, by VI Martynenko and MK Glozman (46-52); Experience in the Use of Asbosilite and Outlook for Expanding its Production, by I Ya Kamenetskiy (53-55); Chernomorite – A New Structural Material, by AD Granik *et al* (56-60); Deck Coatings, Cements and Compounds in Ship Construction, by I Kamenetskiy (60-63); Study of Flame Spread in Models of Ship Living Quarters, VM Sidoryuk *et al* (64-70); Composition and Toxicity of the Products of Thermal Decomposition and Combustion of Polymeric Materials, by VS Ilichkin *et al* (71-80); Use of Thermal and Thermogravimetric Analysis in Fire-Engineering Research, by VM Sidoryuk and MN Fedotov (81-91); Improvement of the Method of Combustibility Testing of Polymeric Materials, by KA Andrianov *et al* (92-98); Contribution to the Problem of Optimizing Ship Fire-Extinguishing Means, by VI Vostryakov (99-105); The Effect of Seawater on the Properties of Medium- and High-Expansion Foam, by MP Volkov *et al* (106-122); Some Features of the Design and Operation of Shipboard Powder Fire-Extinguishing Systems, by MN Fedotov *et al* (123-130); Increasing the Effectiveness of Using Inert Gas Systems of Oil Tankers, by AE Pass and DYu Krokhmal (131-135); Problems Involved in Planning Effective Gas Exchange in Tanks of Oil Tankers Equipped with Inert Gas Systems, by GS Khordas (136-143); Study of the Gas Contamination of Enclosures and Open Deck Sections in Tankers and Gas-Carrying Ships and its Influence on the Generation of Hazardous Zones, by VD Belash *et al* (144-156); Ensuring Fire and Explosion Safety in Transporting Hazardous Cargos by Maritime Transportation, by VP Somov *et al* (157-161); and Extinguishing Superstructure Fires Using Ventilators, by VI Konyashev and GP Pavlov (162-168). (RZh)

433. Anderson W [*Nottinghamshire County Fire Service, UK*]
FIRES AND OTHER EMERGENCIES IN INLAND PORTS AND WATERWAYS
Fire; 70(864):17-18, 1977

The fire hazards of inland waterway craft in the UK, the materials used in their construction, the crowding of waterways by leisure craft, the dense commercial traffic with hazardous cargo, and other potential hazards are identified. The ability of the established fire service to handle such emergencies is questioned. Seven suggestions are offered to meet such emergencies, including liaison with police and river authorities, knowledge of waterway systems, special personnel training, provision of water craft, liaison with educational and sporting organizations, liaison with air sea rescue teams, and the provision of equipment and a proper safety procedure for firefighting personnel.

434. Brown DV [*London Fire Brigade, UK, Fire Prev Branch*]
AIRCRAFT OR BUILDING: ARE FIRE SURVIVAL PROBLEMS IDENTICAL?
Fire; 70(866):131-132, 1977

Fire and its effects on humans has a number of common features in whatever situation it takes place. The survival or otherwise of people in an aircraft is dependent on criteria similar to those for fire survival in a fire situation anywhere else. In these terms the author considers design philosophies in which the features common in high fire risk buildings can be applied to aircraft fire prevention design to forestall the eventuality of an in-flight fire.

435. Blavy A [*Soc Nat Ind Aerospat, Suresnes, France*]
FIRE PREVENTION ON BOARD AIRCRAFT
Fire Internat; 5(54):106-108, 1976 (English, French, German; Spanish Summary)

Methods of improving fire prevention on board civil aircraft by partitioning the space between the structure skin of the fuselage and the interior wall cladding by means of flexible coated asbestos sheeting are described. Also described is research currently being carried out in France into types of individual lightweight hoods made of special clear plastic to enable aircraft passengers to survive until evacuation. (This article is an abridged version of a paper presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.) 1 fig.

436. Brennemann JJ [*United Air Lines*], Hewes BV and McClarran WH
THE AIRCRAFT AND FIRE
Fire Internat; 5(54):18-29, 1976 (English, French, German; Spanish Summary)

Possible improvements in aviation fire protection were discussed on the occasion of an NFPA seminar in Geneva in 1976. The representative of the airline companies (Brennermann) considered the problem of crashproof fuel containers or the modification of fuels, the frequent change of testing standards for aircraft interior materials, and fire compartmentation of jumbo aircraft. The pilot (Hewes) commented on determination of the quantities of extinguishants required for smaller airports, extension of the safety zone of runways, and crashproof cabins. The fire protection engineer (McClarran) emphasized the relationship between the large quantities of flammable materials in aircraft cabins and cargo holds and the inadequate fire protection facilities and pushed for automatic fire alarm and extinguishing systems in passenger and cargo compartments. 1 fig. (Fachdok 13/0289)

437. Powers PR, Meulen, van der, SU, Ferguson RJ, Wilde KK and Pizel R
THE AIRPORT AND FIRE
Fire Internat; 5(54):30-57, 1976 (English, French, German; Spanish Summary)

The various problems connected with rescue and extinguishment at airports are discussed in five parts by the five authors. The first part deals with inadequate coordination of rescue and fire-fighting activities at a number of airports. The plan for a well-functioning airport fire department is developed in part 2. Part 3 deals with rapid intervention vehicles (RIV) at airports and with the necessary fire-fighting measures. The standards and recommendations for rescue and firefighting published in Annex 14 to the Convention on International Civil Aviation are considered in Part 4. The present equipment for fighting fires in wide-bodied or supersonic aircraft at the Orly, LeBourget, and Charles de Gaulle airports is described. (This is an abridged version of several papers presented at the International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, September, 1976.) 1 fig, 5 tables.

438. Gumley JR [*EF Australasia Pty, Ltd*], Invernizzo CG and Khalad M
LIGHTNING PROTECTION — A PROVEN SYSTEM
Fire Technol; 13(2):114-120, 1977

An integrated lightning protection system involves the use of ionizing sources to enhance the attracting power of the air terminal to provide a protective radius of up to 250 m under ideal conditions. The air terminal is earthed to the core of a patented coaxial cable, which conveys the discharge to the ground, while the earthed outer screen of the coaxial cable contains the discharge. Because of its low impedance and shielding grounding conductor, the system prevents the development of dangerous potential gradients and reduces the risk of side flashing and arcing between the elements of the system being protected. 6 figs, 1 table. (NFPA)

439. Santamaria JL [*ICAO Air Navigation Bureau*]
RESCUE AND FIRE FIGHTING NEEDS AT AIRPORTS
ICAO Bull; 31(9):21-23, 1976

Rescue and fire-fighting needs at airports are discussed in terms of the critical area concept and the survival versus response time, on the basis of data collected on aircraft accidents involving fire occurring on or in the vicinity of an airport. Future efforts to improve the safety of aircraft operations are reported. 2 figs.

440. Anderson RA and Johnson GA
AIRCRAFT INTERIOR SANDWICH PANEL DEVELOPMENT
J Fire Flammability; 8(3):364-381, 1977

This paper describes a NASA-funded program to develop materials for use as lavatory wall panels, sidewall panels, and ceiling panels possessing flammability, smoke and gas emission, and toxicity (FS and T) characteristics superior to existing epoxy resin based materials. The objective of this program is to select a sandwich panel-decorative film system that possesses both improved FS and T characteristics and acceptable cost, processing requirements, decorative capability, abrasion resistance, stain resistance, scuff resistance, and washability. The selected system is to be based on current state-of-the-art materials. Three resin systems (viz, bismaleimide, polyimide, and modified phenolic) and four decorative films were evaluated. One resin system (modified phenolic) and one decorative film (Tedlar-polycarbonate) were selected after a screening phase for incorporation into a final evaluation phase. The final phase will include the development of an overall ranking system for each of the sandwich panels. Some of the characteristics relevant to this ranking are smoke release, heat release, cost, mechanical strength, and toxic gas production. The location and usage of the sandwich panels will determine the relative ranking of each of the resin systems and, hence, will dictate the resin system to be used. Materials for compartment panels such as lavatory and galley walls should be selected on the basis of resistance to flame penetration, and materials for sidewalls and ceilings should be selected on the basis of smoke and gas emission characteristics. 24 figs, 7 refs. (Author)

441. Lifant I [*US Dept Transportation, Transp Systs Center, Cambridge, MA*]
FIRE SAFETY PROBLEMS IN GROUND MASS TRANSPORTATION
J Fire Flammability; 8(3):255-261, 1977

The National Transportation Policy issued by the Secretary of Transportation on September 17, 1975, provides guidelines for national programs to provide consumer protection with due consideration for the impact on the economy, the environment, and energy conservation measures. The implementation of this policy requires the development of a new methodology for addressing the problems of fire risk in transportation vehicles and promulgation of regulations to increase accident survival of vehicle occupants. The methodology must include identification of fire risk levels in the various transportation modes: analysis of the fire environment, elimination or reduction of specific hazards related to fire, and economic impact. Each of the administrations of the Department of Transportation has its own Office of Safety and pursues research in the areas of fire safety that relate to its own, sometimes unique problems. What they have in common are the combustible materials, of which vehicles and other parts of their systems are constructed. In this paper, therefore, the common materials and their applications and some of the unique hazards associated with different modes of ground mass transportation are discussed.

442. Anon
NEW INCOMBUSTIBLE, NON-ASBESTOS PANELS FOR SHIP INTERIORS
Schiff Hafen; 28(10):1005-1006, 1976 (German)

A new non-asbestos insulating board called Cape Marine Board has been developed for the construction of incombustible structures in ship interiors. This new board is intended primarily as a baseboard for decorative surfaces. The standard board size is 2440 x 1220 mm and is delivered in 6 standard thicknesses of from 12 to 32 mm. The board, made of calcium silicate with a non-asbestos reinforcement, can be easily worked (sawing, drilling, etc), is resistant to chemical or biological agents, and is water resistant.

443. Hahne J [*Ingenieurhochschule Seefahrt, Warnemuende/Wustrow, GDR*] and Sitte S [*VEB Fischkombinat, Rostock, GDR*]
IMPROVING FIRE-PROTECTION TRAINING ON OCEAN-GOING VESSELS
Seewirtsch; 8(11):667-668, 1976 (German)

The two principal factors important for fire safety on board ships are improvement in structural fire protection, especially in the use of incombustible materials and modern fire detection and fighting systems, and improvement in active firefighting by the ship's personnel, achieved by increasing theoretical understanding and by conducting training under near-real conditions, eg, at appropriate land installations that simulate such conditions. 3 figs, 2 refs.

444. Anon
AIR CARRIER CABIN SAFETY. A SURVEY. Fed Aviat Admin, Washington, DC; Unnumbered report, 230 pages, Dec 1976
Availability: NTIS AD-A037 906/5GA

This is an overview report on the status and efficacy of the Federal Aviation Administration's air carrier cabin safety program. Up-to-date information on recurring cabin safety issues and problems was solicited from airplane manufacturers, air carriers, flight and cabin crews, associated organizations, and others. The National Transportation Safety Board provided pertinent accident data and safety recommendations developed from aircraft accident investigation. The survey identifies significant recurring cabin safety operational problems including flight attendant training and protection, flammability of cabin interiors, toxicity and smoke generation during post-crash fires, emergency evacuation, survivability. Seventeen recommendations are presented for instituting actions by the FAA's Flight Standards Service, Office of Aviation Medicine and Office of Aviation Safety to resolve recurring cabin safety problems and for continuing long-term improvement of cabin safety.

445. Mandel G, Rubinstein RI, Pinto JJ and Meschkow SZ
DIRECTORY OF AEROSPACE SAFETY SPECIALIZED INFORMATION SOURCES. VOL 2. Lewis Res Center; LEW-1272, NASA CR-134929, 1976
Availability: NTIS N76-25153

Volume 2 of the *Directory of Aerospace Safety Specialized Information Sources* has now been published, completing NASA's present effort to compile a handbook of organizations and experts in specific, well-defined areas of safety technology. Although this directory has been assembled primarily for use by the aerospace community, its comprehensive coverage provides information of considerable value to safety professionals in many fields. The directory is designed for safety specialists as an aid for locating both information sources and individual experts in engineering-related fields. Volume 1, published in 1974 (NASA CR-121206, N74-10887), lists over 170 organizations and approximately 300 individuals who can provide safety-related technical information in the form of documentation, data, and consulting expertise. Vol 2 lists over 150 additional organizations and approximately 580 additional individuals. The two volumes are complementary, but are not collated. The information sources listed maintain specialized collections or files of material relevant to aerospace safety and regularly provide qualified users with information on a particular subject or with referrals to outside experts. The directory covers sources of aerospace design, tests and operation, as well as information on hazard and failure cause identification, accident analysis, and materials characteristics. Special emphasis is given to relevant safety information sources on aircraft fire hazards and aircraft interior flammability. Related areas covered include the handling and transportation of hazardous chemicals, radioactive isotopes, and liquefied natural gases. Information sources and experts are indexed both alphabetically and by subject areas of expertise. (Author)

446. Kourtides DA, Parker JA and Hilado CJ
THERMOPLASTIC POLYMERS FOR IMPROVED FIRE SAFETY. Nat Aeron and Space Admin, Ames Res Center, Moffett Field, CA; NASA TM-X-73185, A-6832, 56 pages, 15 figs, 16 tables, Nov 1976
Availability: NTIS N77-14206/5GA

The thermochemical and flammability characteristics of some typical thermoplastic materials currently in use and others being considered for use in aircraft interiors are described. The properties studied include: 1) thermomechanical properties such as glass transition and melt temperature; 2) changes in polymer enthalpy by differential scanning calorimetry; 3) thermogravimetric analysis in anaerobic and oxidative environments; 4) oxygen index; 5) smoke evolution; 6) relative toxicity of the volatile products of pyrolysis; and 7) selected physical properties. (Author)

447. Bartoszek EJ, Christofas A and Nannelli P
DEVELOPMENT OF A SPECIAL PURPOSE SPACECRAFT INTERIOR COATING. PHASE 2. TECHNICAL REPORT 13 NOV 1975-31 MAY 1976. Pennwalt Corp, King of Prussia, PA; NASA CR-151197, 13 pages, Feb 1977
Availability: NTIS N77-18221/0GA

Numerous acrylic and epoxy modifiers for the fluorocarbon latex resin base were investigated. Optimum coatings were developed by modifying the fluorocarbon latex with an epoxy containing hard acrylics as modifiers, displayed attractive properties and potential for further improvements. The preferred formulations dried to touch in about one hour and were fully dried in about 24 hours under normal room temperature and humidity conditions. In addition to physical and mechanical properties either comparable or superior to those of commercial solvent base polyurethane or polyester coatings, the preferred compositions meet the flammability and offgassing requirements specified by NASA. (Author)

7. FIRE SERVICE ORGANIZATION AND FACILITIES

a. ADMINISTRATION, ORGANIZATION AND MANAGEMENT

448. Cameron AJ
TOWARDS A BETTER PUBLIC FIRE SERVICE
Fire; 69(861):499-502, 505, 1977

Areas in which it might be profitable to direct further thought and research toward the creation and implementation of a management development system for the UK Fire Service are indicated in this article, which represents one chapter of a dissertation on the management development subject. The topics that constitute these areas are analyzed individually, as follows: recruiting, qualifying examinations, timing, appraisal, selection, college courses, management, and discipline.

b. EDUCATION AND TRAINING

449. Hagen, M von [*Bayer Landesamt fuer Brand- u Katastrophenschutz, FRG*]
IDEAS ON ALERTING AND TRAINING FIRE DEPARTMENTS FOR TECHNICAL ASSISTANCE IN BAVARIA
Brandwacht; 31(6):107-109, 1976 (German)

The main factor in rendering technical assistance is time, which is calculated from the instant it becomes necessary to render assistance to the initiation of rescue work, divided into three principal steps: transmission of the report, dispatch of assistance, and arrival at the scene. The first step is considered to be the time interval from the instant communication of the accident begins until full receipt is finished at the fire station (including determination of location of the accident): In Bavaria (FRG) an emergency call system (Notrufsystem-73) is being introduced by which an emergency call can be made without first looking up the telephone number of the fire unit and without paying for the call from any booth by dialing 100 or 112. The call is transmitted to the nearest fire unit. Some difficulty may arise when accidents take place in highway sections far from population centers, where the accident report call depends on the traffic density and the distance to the nearest telephone. The difficulties of developing an alarm network are noted, particularly the high cost of the communication system and delays in installing the equipment. When it is not possible to determine the nearest fire unit, the call is connected to the nearest police or disaster station, which can be reached by dialing 110. The accident monitoring service will be handled by the police until the full system is operational. Control observation stations connected with the police, fire service and the first aid service of the area are being organized and equipped with radio communications. Great attention is paid to training the personnel of the rescue services at fire stations. An outside limit of 10 minutes is being established as a criterion of effective assistance, measured from the time of receipt of a call to the instant rescue work begins. The maximum time of transmission of a report should not exceed 2 min; the dispatch time also should not exceed 2 min.

450. Hancock L
TRAINING BY OBJECTIVES. PART 1
Fire Command; 44(7):38-39, 1977

This first installment of a four-part series is designed to help the fire-service instructor to achieve better results from training sessions by developing a systematic approach to instruction, that is, teaching by objectives. This approach requires the instructor to enter a training session with the objective of inculcating skills students should possess at the end of a session.

451. Hancock L
TRAINING BY OBJECTIVES. PART 2
Fire Command; 44(8):36-37, 1977

In this second installment of a four-part series on a systematic approach to firefighter training the author discusses the instructor's need to know the entry level of the trainees, that is, that level of their knowledge for a particular training session. 1 chart.

452. Hancock L
TRAINING BY OBJECTIVES. PART 3
Fire Command; 44(9):54-55, 1977

In this third installment of a four-part series, a systematic sequence of instruction that ensures the full understanding of every student is outlined. Most instruction should be sequenced in the same order as the events being taught occur. With proper organization, the instructor will eventually have on file complete courses on many topics. 1 chart.

453. Lodge J [*Civ Aviat Authority, UK*] and Robertson WD
TRAINING FOR AIRPORT FIRE-FIGHTING AND RESCUE
Fire Internat; 5(54):89-92, 1976 (English, French, German; Spanish Summary)

In the first part of this two-part report the progress made in the UK in the training of personnel for airport rescue and firefighting since inception of the Civil Aviation Authority Fire Service Training School in 1949 is described. The school has assisted in defining standards of achievement that have elevated airport fire service personnel to a position of genuine professional standing. In the second part (Robertson) of this report the on-the-job training conducted at the Sea-Tac International Airport in Seattle, Washington, is described. (This article is an abridged version of two papers presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.)

454. Anon
RECOMMENDATIONS ON THE RELATIONSHIP BETWEEN THE NATIONAL FIRE PREVENTION AND CONTROL ADMINISTRATION AND THE STATE-LEVEL FIRE COMMUNITY. FINAL REPORT OF A WORKING SEMINAR HELD IN ATLANTA, GEORGIA, ON OCTOBER 4-8, 1976. Internat Soc Fire Service Instructors, State Directors of Fire Trng Sect, Hopkinton, MA; Unnumbered Report, 130 pages, Jan 1977
Availability: NTIS PB-263-799/9GA

This is the final report of a 1976 working seminar held in Atlanta, Georgia, at which the fire education and training leaders of virtually all state governments were brought together to focus on common problems. Overviews are given of the organizations involved in fire service training and of the NFPCA, its Academy and Program Offices: the International Society of Fire Service Instructors; the State Directors of Fire Service Training Section; the National Fire Prevention and Control Administration; the National Academy for Fire Prevention and Control; the Office of Public Education; the Fire Planning and Research Office (now the National Fire Safety and Research Office); and the National Fire Data Center. Appendixes contain the seminar agenda, list of attendees, workshop assignments, the questions from which consensus opinions were drawn, the worksheet used to locate and describe state-level programs, and copies of enabling legislation in the states of Delaware, Massachusetts, Ohio, New Hampshire, and Louisiana.

c. FACILITIES

455. Anon

THE NATIONAL ACADEMY FOR FIRE PREVENTION AND CONTROL: ENVIRONMENTAL IMPACT ASSESSMENT

US Dept Commerce, Nat Fire Prev and Control Admin; 90 pages, Sep 1976

This report constitutes an environmental impact assessment of the proposed action to locate the National Academy for Fire Prevention and Control (Academy), as well as the National Fire Prevention and Control Administration (NFPCA), at the Marjorie Webster Junior College in northwest Washington, DC. The NFPCA/Academy are to be accommodated by the existing vacant college facilities, which require only renovation. In addition, a small visitor parking lot, modification to an existing parking lot, and an internal roadway are proposed for construction. The findings of the environmental impact assessment report are summarized as follows. The proposed action would have no significant impact, either positive or negative, on the environment. The impact of the NFPCA/Academy use does not represent a change in operation or scale from that of the Marjorie Webster Junior College when it was in existence. Further, because the NFPCA/Academy have selected a developed site, there are not the usual negative impacts associated with disruption to the natural-biological environment, nor are there requirements for modifying urban systems such as utilities or roadways. Overall, the NFPCA/Academy proposed action is of benefit to the immediate surrounding community, as well as to the metropolitan area. By locating in the Washington metropolitan area, the Academy provides employment and spending. There is, however, a potential negative impact as related to traffic generation, and more specifically, parking. (This report is available from NFPCA.)

d. FIRE APPARATUS

456. Zillmer E

REMARKABLE MULTIPURPOSE PUMP

Brandschutz; 31(4):103-104, 1977 (German)

The design and operating principle are given for a multi-purpose pump designed to deliver all kinds of liquids – not only water, but also oil, burning liquids, etc. – from depths lying below the geodetic suction level. The technical data of the "Aquamat-Turbine-Immersion Pump" (ATTP) are as follows: 12 kg (light metal) or 55 kg (steel); 340 mm height; 380 mm maximum diameter; and 500-1,000 ℓ/min delivery rate. 9 figs.

457. Hodson JM

FIRE FIGHTING VEHICLES

J Br Fire Serv Assoc and Ind Fire Prot Assoc; 4(2):55, 57-58, 1976

The specifications for the chassis of fire apparatus are given and the level of compliance with these requirements of the chassis produced by a number of companies in Great Britain is analyzed. Variants of the composition of the fire-fighting equipment, of the motor and cab of the fire apparatus are considered. It is pointed out that 10% of all the firefighter accidents are connected with the operation of fire apparatus. In particular, 32% of these accidents occur while the crew is getting into or out of the cab. The advantages and deficiencies of hydraulic lifts and mechanical aerial ladders are analyzed. The technical specifications and tactical features of the emergency fire apparatus (Gloster Saro and Carmichael) and of airport fire-fighting apparatus (Chubb Pathfinder and Carmichael Jet Ranger 4000) are given. 3 figs. (RZh)

458. Anon

PROTECTION SYSTEM FOR LARGE MULTIPURPOSE FIRE-EXTINGUISHING APPARATUS

Ladenburger Kreis; (49):18, 1976 (German)

A combined fire apparatus (Tro TLF-80) was demonstrated for the first time at the fire exhibition in 1976 at Geneva, which was held in conjunction with an international seminar on the problems of fighting aircraft fires. The principal design difference of this fire apparatus is its fire protection system, which makes it possible to approach very closely to a fire hazard zone. The system consists of five foam nozzles that set up a protective foam screen around the apparatus: 3 are located in the forward portion, and one each between the axles and wheels on either side of the rear portion. The system is remote-controlled by pressing a button. The total output of the system is 15 m^3/min of foam with an expansion factor of 15; the foam factor is 1:70. Also described are the main technical parameters of the apparatus: the water reserve of 8,000 ℓ; 750 kg of powder; and 1,000 ℓ of foam concentrate. The output of the FP-48/8 fire pump is 4,800 ℓ/min; the range of the foam jet is about 55 m and of the water jet about 60 m. (RZh)

459. Anon

AUTOMATIC 30-METER ROTATING LADDER WITH ORTHOGONAL PLATFORM AND STABILIZATION DEVICE

Prot Civ Secur Ind; (259):59-62, 1976 (French)

A technical description is given of a new model of a 30-meter mechanical ladder with hydraulic drive. The ladder is equipped with an automatic mechanism for compensation of lateral tilt.

7. FIRE SERVICE ORGANIZATION AND FACILITIES

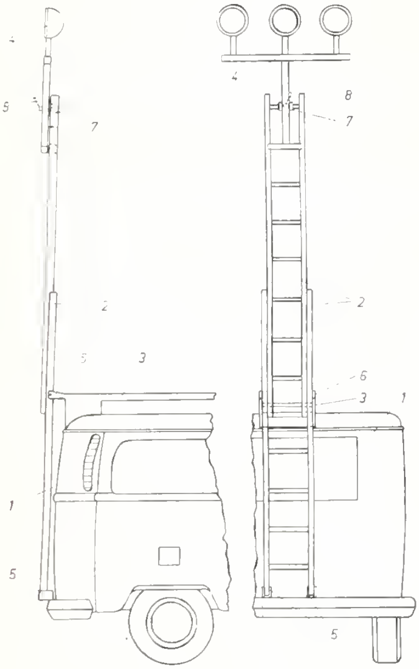
d. Fire Apparatus—Continued

460. Simons J
FLOATING FIREFIGHTERS
Schiff Hafen; 28(10):1007-1008, 1976 (English)

Two new floating vessels built for firefighting service on London's River Thames are described. The hull design is of special importance: the layout was planned for functional duties and personnel amenities; a fire-retardant material (glass-reinforced plastics) is used in construction; and a water spray deck protection system is installed. 2 figs.

461. Anon
FIRE VEHICLE WITH EXTENSION LADDERS, SECTIONAL LADDERS, ET AL
Austrian Patent No. 328,868; Cl 61a 6/50, (A62C 27/16), Appl 16 Jun 1972, Discl. 12 Apr 1976, Assignee: Konrad Rosenbauer KG, Austria

A patent is disclosed for the use of a fire vehicle with various kinds of ladders to serve as elevated lighting platforms for fireground illumination. The floodlight rack is attached to the top rung of the upper section of the ladder. The floodlight ladders can be attached to the side or rear of the vehicle. 1 claim, 2 drawing figs.



e. INFORMATION SYSTEMS

462. Halpern SM, Hauer CA and Polk S
FEASIBILITY STUDY OF A NATIONWIDE FIRE HOT-LINE. MITRE Corp, METREK Div, McLean, VA; MTR-7438, 41 pages, Jan 1977
Availability: NTIS PB-265 653/6GA

For purposes of this study, the fire hot line concept is that of a one-way communication system providing rapid dissemination from a central point to each of the 20-25,000 fire departments in the country. Consideration was also given to a query-type hot line, that is, a central point (or telephone number) that fire departments could access to request information on a specific topic. This report documents the findings and results of a feasibility study of such a nationwide fire hot line performed by METREK, a division of The MITRE Corporation and sponsored by the National Fire Prevention and Control Administration. (Author)

f. INSPECTION

463. Bruemmer D
RESULT OF A FIRE-SAFETY INSPECTION AND DETERMINATION OF THE STATUS OF HIGHRISE BUILDINGS IN HAMBURG
Brandschutz; 31(2):31-32, 1977 (German)

On the basis of spectacular highrise building fires abroad and the resultant uneasiness among large segments of the population, a concentrated "Fire-Safety Inspection of Highrise Buildings" program was carried out recently in Hamburg (FRG). In order to be able to get a picture of the structural and operational status, a total of 55 questions had to be answered for each building. Structural deficiencies were found in a number of buildings, eg, in stairwells and corridor walls, unapproved alterations, and absence of standpipes. Among the operational deficiencies were the following: alteration of fire- and smoke-check doors, damages to dampers and standpipes, relocated escape routes and fire department accesses. Rectification of these deficiencies is being handled by the appropriate building inspection authorities. (Fachdok 13/0485)

g. INVESTIGATION AND REPORTING

464. Judd RL [*Civ Def Rescue Squad, New Britain, CT*]
TIPS FOR WRITING REPORTS THAT CONTAIN USEFUL FACTS
Fire Eng; 130(8):133, 135-136, 1977

Basic problems about report writing that need to be considered before organizing data about an accident, fire, calamity, or the like are discusssed, including: (1) the function of the report; (2) the meaning of formulating the elements about the incident; (3) what skills, knowledge, and data the report maker needs; (4) possible relationships with others involved in the incident being reported; and (5) a few basic considerations, such as the use of jargon. The main elements of a report are outlined in 10 points.

h. PERSONAL EQUIPMENT

465. Fischer W [*Berlin Fire Department, FRG*]
BELT ATTACHMENT FOR COMPRESSED-AIR BREATHING APPARATUS
Brandschutz; 31(4):105, 1977 (German)

A belt attachment that can be used in conjunction with compressed-air breathing apparatus as a rescue device has been developed by members of the Breathing Apparatus Workshop of the Berlin Fire Department in collaboration with the Auergesellschaft GmbH, Berlin, FRG. The most important part of this belt attachment unit is the T-shaped connector. Since it is provided with the same couplers as the compressed-air breathing apparatus, it can be fitted into the low-pressure line with the usual manipulations. A 2-m long low-pressure hose with a face mask can be attached to the loose end. This device makes it possible, in the case of rescue operations in smoke-filled buildings, to allow the person being rescued to tap onto the compressed-air cylinder of the rescuer, and the rescued person can then be led safely through the smoke. 2 figs. (Fachdok 13/0668)

466. Barnhart WL [*Bendix Launch Support Div, Special Projects, Cocoa Beach, FL*] and Kamin JI
PROTECTIVE CLOTHING PRIORITIES FOR FIREFIGHTERS
Nat Saf News; 115(6):59-64, 1977

As a result of a year-long study program to assess the need for protective clothing for industrial workers and firefighters, research areas and their order of priorities are identified separately for the two categories and are summarized. The priority ranking for industrial workers is being utilized within the National Institute for Occupational Safety and Health (NIOSH) safety program in the research project on Personal Protective Equipment, whereas the ranking for firefighters is applicable to the research project entitled Fire Hazards Control. In the industrial/occupational areas or operations, 27 priority rankings are listed in the table. The priorities for firefighters cover seven points, viz: respiratory protection requirements (national standard); gloves; boots (performance); turnout coats (comfort); whole-body protective systems (clothing interfaces); helmets (safety criteria); and turnout coats (impact protection). 4 photos, 2 tables, 7 refs.

467. Hashegawa K, Sueyoshi M and Kogata I
REBREATHING TYPE OXYGEN BREATHING APPARATUS. PART 2
Fire Sci Lab Japan. Rep; (13):116-121, 1976 (Japanese)

The design and operating principle, as well as the results of medico-physiological operational tests of a recirculation-type oxygen breathing apparatus that ensures highly effective cleansing of the exhaled air and repeated use of the breathing mixture, are described. The set, which is intended for use in fires and other disasters with a high level of gas contamination, is provided with three oxygen cylinders pressurized to 150 kg/cm². The oxygen apparatus was tested in a medium saturated with smoke and highly toxic gaseous combustion products of special plastic smoke sources. 8 figs, 6 tables, 2 refs. (RZh)

468. Anon
BREATHING MASK
FRG Patent No. 1,914,224; Cl A62B 9/02, Appl 20 Mar 1969, Discl. 8 Jan 1976, Assignee: Draegerwerk AG, FRG

This patent relates to a breathing mask with a flutter valve exhausting into the ambient air and a double sealing rim. The rims form a space around the edge of the mask through which part of the exhaled air passes. This space communicates with the ambient air. The mask is provided with a flutter valve fitted parallel to the space between the two sealing rims through which part of the exhaled air escapes directly into the ambient air. The connection between the peripheral space and the ambient air and/or the inside of the mask consists of an escape aperture with at least one nonreturn valve. The advantage of this arrangement is that if there are leaks between the rims and the skin of the mask wearer owing to the negative pressure generated during inhalation, only exhaled air can be sucked into the mask from the space between the sealing rims, thus preventing penetration of (toxic) ambient air into the mask. 3 claims, 2 drawing figs.

469. Pearce FC, Jr
CONNECTOR DEVICE FOR BREATHING APPARATUS
US Patent No. 3,995,626; Cl 128/142.2, (A62B 7/04), Appl 20 Jun 1975, Discl. 7 Dec 1976, Assignee: Inventor

The disclosure embraces a connecting tee for use with a contained air supply to enable two or more individuals to draw air from the supply and includes a chamber having one passage connected to a source of air, a first passageway with a one-way check valve for supplying air to a first user and a second passageway which is provided with a pair of one-way check valves; the first valve of the second passage permits air flow out of the connector from the source but prevents inflow of external air; the second check valve of the second passageway is normally in a closed position but is manually opened where a second user must establish communication with the source of air carried by the first user. 6 claims, 7 drawing figs. (Author)

470. Lovell JS
PORTABLE BREATHING SYSTEM. Nat Aeron and Space Admin, LB Johnson Space Center, Houston, TX; NASA CASE-MSC-16182-1, 24 pages, Mar 1977
Availability: NTIS PAT APPL-780 930/GA

A semiclosed-loop rebreathing system is provided for use in a hostile environment. The system is characterized by a packed bed regenerative heat exchanger providing two distinct temperature-humidity zones of breathing gas with one zone providing cool, relatively dry air and the second zone providing hot, moist air. Exhaled gas is passed through the packed bed regenerative heat exchanger to increase the temperature and humidity of the gas and is then passed through a sorbent canister containing a lithium hydroxide bed to remove carbon dioxide. The carbon dioxide-free gas is then passed through the regenerative heat exchanger in the reverse direction to cool and dehumidify the gas to normal breathing conditions.

471. Wood WB
NASA FIREFIGHTERS BREATHING SYSTEM PROGRAM REPORT. Nat Aeron and Space Admin, LB Johnson Space Center, Houston, TX; NASA TN-D-8497, JSC S-465, 73 pages, May 1977
Availability: NTIS N77-24772

Because of the rising incidence of respiratory injury to firefighters, local governments expressed the need for improved breathing apparatus. A review of the NASA firefighters breathing system program, including concept definition, design, development, regulatory agency approval, in-house testing, and program conclusion is presented. (Author)

472. Kupferman Z
NON-REFLECTIVE, WETTABLE, FIBROUS FABRIC ASSEMBLIES FOR FIREFIGHTERS' CLOTHING. Navy

7. FIRE SERVICE ORGANIZATION AND FACILITIES

h. Personal Equipment—Continued

Clothing and Textile Res Facility, Natic, MA; TR-123, 6-76, 34 pages, Jan 1977
Availability: NTIS AD-A038 028/7GA

The Navy Clothing and Textile Research Facility (NCTRF) has developed a nonreflective, wettable, firefighters' proximity garment made from water-absorptive fibrous fabric assemblies in combination with a vapor barrier fabric and insulation liner. When wetted out, the garment affords heat protection equal to or greater than the highly reflective, aluminized material currently being used in garments worn by firefighters in proximity to JP-4 fuel fires. Laboratory investigation of comparative heat-protective characteristics of fibrous fabric assemblies shows that, when they are dry and exposed to a radiant heat flux of 1.82 cal/sq cm/sec from about 50 to 83 seconds (total heat transfer of 150°F to back of assembly), the outershell, inner liner and vapor barrier are charred, while the insulation liner exhibits no change. Seven of the dry assemblies, when tested wet for a minimum exposure time of 180 seconds, showed the surface of the outershell exhibited no change to burnt, the surface of the inner liner exhibited no change to singed, and the vapor barrier and insulation liner no change. After mild abrasion and soiling, the aluminized 20-ounce asbestos fabrics, in assembly with a vapor barrier and insulation liner and exposed to the same test conditions as the wet assemblies, showed a significant reduction in exposure time of 48 seconds, compared with the wet fabric assembly and slightly worse than the dry fabric assemblies. (Author)

i. PERSONNEL AFFAIRS

473. Kunce HW [*Metropolitan Dade Cty Fire Dept, FL*] and Swartz J
FACTORS IN FIRE-FIGHTER TEST/TASK ANALYSIS
Fire J; 71(1):31, 35-38, 1977

Efforts are being made to provide the tools that a fire chief needs to assure adequate screening of applicants, recruits, or firefighters relative to their probable future career success. In the development of valid tests, it is first necessary to develop a firefighter task analysis based on comprehensive experimental design. For example, it is important to screen out applicants or recruits whose task of physical, mental, or psychological capabilities could prevent them from adequately performing their duties or even endanger them or their fellow firefighters. 22 refs. (NFPA)

474. Ukai T, Watanabe K, Nojiri T, Endo N, Ojaki K, Takanabe T and Yao K
BASIC RESEARCH ON FIREMEN'S PHYSICAL STRENGTH
Fire Sci Lab Japan. Rep; (13):106-109, 1976 (Japanese)

The methods and results of medico-physiological studies to determine the permissible limits and optimal values of anthropometric data for persons entering the fire device are described. About 100 men of various age categories (19-54 years) were investigated. From the results of the investigations a system of complex numerical indicators (coefficients) was developed; determination of these indicators in each individual case makes it possible to evaluate the anthropometric firefighter candidates with maximum objectivity. Statistical methods were used in development of the system of indicators. 3 figs, 2 tables, 1 ref. (RZh)

j. PUBLIC RELATIONS

k. TOOLS, APPLIANCES, AND GENERAL EQUIPMENT

475. Mazur S
RESCUE EQUIPMENT
Przege Poz; 64(8):11-12, 1976 (Polish)

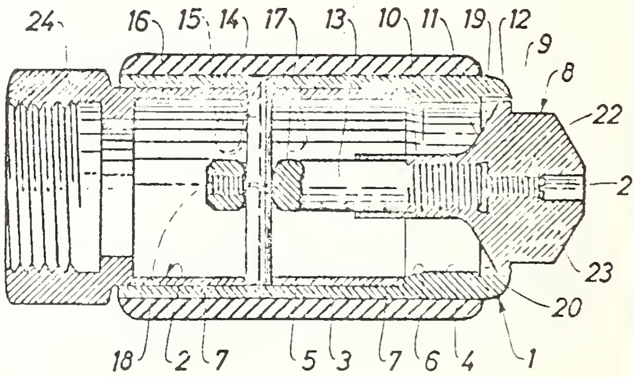
It is emphasized that a study must be made of new ways of organizing the technical rescue means of fire companies. It must be kept in mind that when a company responds to a call it does not always know what kind of emergency rescue work might have to be done, and experience has shown that calling on the municipal emergency services does not guarantee success. It is proposed that the technical rescue equipment of the fire companies be supplemented with compressors and compressed-air hammers, technical assistance vehicles, and cranes (hoists). 1 fig. (RZh)

476. Schiffers JM
AUTOMATIC HOSE REEL
French Patent No. 2,274,539; Cl B65H 75/34, A62C 33/04, Appl 13 Jun 1974, Discl. 9 Jan 1976, Assignee: Author

This invention relates to an automatic hose reel for a nozzle, especially for a playpipe. The drum of the reel is rotatably mounted about a tubular axis through which the water is supplied, the shutoff valve is screwed into the central duct of the tubular axis, and communication means are provided to transmit the rotational motion of the drum to the shutoff valve to open it. When the playpipe is advanced, the valve opens automatically after a certain number of turns of the drum. 3 drawing figs.

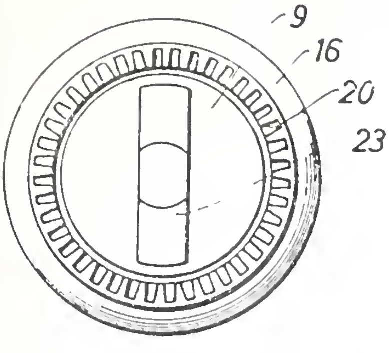
477. Eggert U
NOZZLE FOR A PLAYPIPE
Swedish Patent No. 383,960; Cl A62C 31/02, Appl 23 Oct 1973, Discl. 12 Apr 1976, Assignee: Author

The nozzle disclosed in this patent is formed by two sleeves, the inner sleeve being capped on one end by a six-sided nut and having an internal thread for fitting onto a playpipe; the outer sleeve fits over the inner and can be turned or moved back and forth by means of a handle which, when moved forward, provides a spray, and backward a solid stream. 12 claims, 2 drawing figs.



7. FIRE SERVICE ORGANIZATION AND FACILITIES

k. Tools, Appliances, and General Equipment—Continued



478. Eggert U
PLAYPIPE FOR FOAM EXTINGUISHMENT
Swedish Patent No. 384,451; Cl A62C 31/12, Appl 6 May 1974, Discl. 10 May 1976, Assignee: Author

The patent disclosure relates to a playpipe consisting of the playpipe itself, which is connected to a fire hose and is equipped with a spray nozzle and a pipe. The output end of the pipe has two foam-generating screens. The inner screen has several large openings and is provided with a circular groove in the center so that the foam-making mixture in the center passes through only one screen. For this reason the central portion of the foam jet has a greater range at a low expansion ratio while the rest of the jet has a shorter range at a greater ratio. The screens can be fitted against each other or separated by a distance of up to 15 mm. The cone of the spray issuing from the nozzle can be regulated by means of a ring on the playpipe. For ease in handling, the playpipe is provided with grip handles. 5 claims, 3 drawing figs.

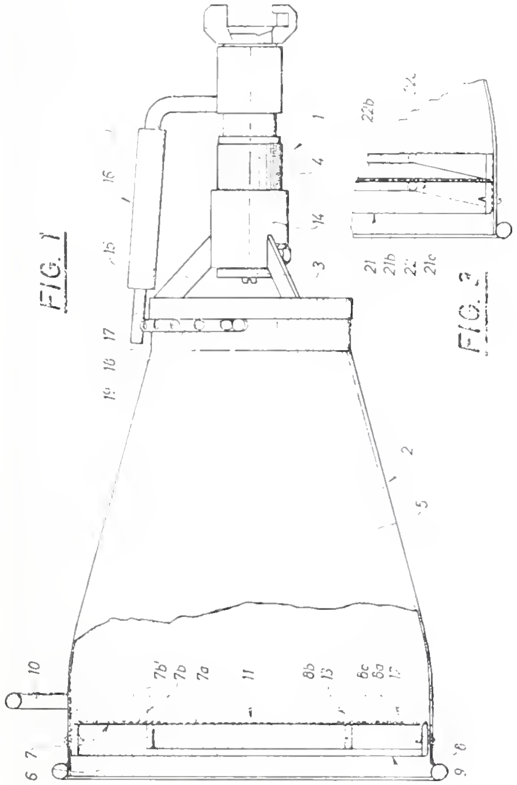
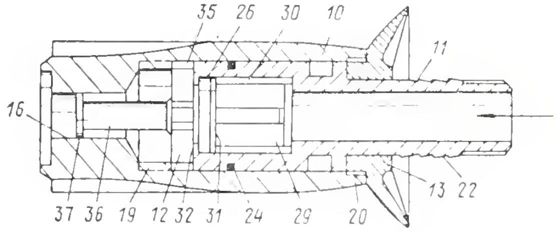


FIG. 1
FIG. 2

479. Dewhurst PE
IMPROVEMENTS IN OR RELATING TO NOZZLES
UK Patent No. 1,441,649; Cl B2F, (B05B 1/12), Appl 3 Oct 1973, Discl. 7 Jul 1976, Assignee: Thomas Glover and Co Ltd, Oldham, UK

The present invention relates to a discharge nozzle for attachment to a fire-fighting hose and adapted to give either controlled jet or alternatively spray discharge. According to the invention, there is provided a nozzle comprising a relatively rotatable tubular handle and body portions with a valve centrally disposed within both these portions and secured to the handle portion so as to rotate with it relative to the body portion, the valve having a stem terminating in a control flange adapted to cooperate with the handle portion at the nozzle outlet. 5 drawing figs.

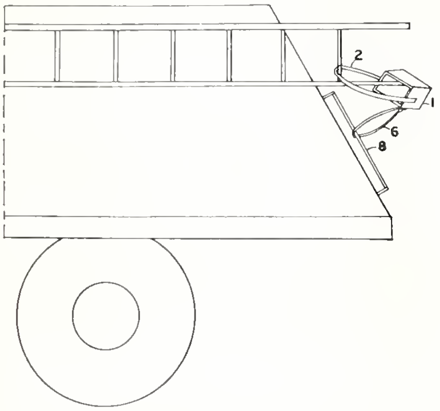


480. Evans JL
IMPROVEMENTS IN FIRE FIGHTING BRANCH PIPES
UK Patent No. 1,442,203; Cl B2F, (B05B 7/12), Appl 12 Apr 1973, Discl. 14 Jul 1976, Assignee: Chubb Fire Security Ltd, Sunbury-on-Thames, UK

According to this invention, a fire-fighting branch pipe for discharging fire extinguishing liquid includes a shut-off valve having a valve member which is movable between a closed position in which the valve member shuts off the flow of liquid through the branch pipe and an open position in which the valve member allows the liquid to flow through the branch pipe under the control of a manually-operable pilot valve, actuation of which controls the flow of fire extinguishing liquid through a passage leading upstream of the valve member to a part of the shut-off valve on which the pressure acts to move the valve member between the closed and open positions, and a dash-pot arranged to limit the rate of movement of the valve member from the open position to the closed position. This arrangement limits the speed of movement of the valve member to the closed position to such an extent that the pressure surge is kept within required limits. 4 drawing figs.

481. McLoughlin J
PROTECTIVE COVER FOR EXTENDING SHAFTS
US Patent No. 3,968,824; Cl 150/52 R, (B65D 59/08), Appl 23 Jun 1975, Discl. 13 Jul 1976, Assignee: Inventor

A protective cover for extending shafts is disclosed. A padded cover or boot enclosure open at one end is fitted over the end of an extending shaft, such as a ladder on a fire truck. An adjustable mounting strap is fixedly connected to one side of the cover at one strap end and removably connected at the other strap end to the opposite side of the cover. A retaining strap with a hook type fastener is connected to the cover, and is also connected to a fixed object to prevent the cover from being lost when the cover is removed from the shaft. 2 claims, 2 drawing figs.



482. Ionov AL, Ionov LP, Rozhnev AA and Novikova IG
DEVICE FOR REDUCING FRICTION IN PIPELINES AND HOSES
USSR Patent No. 500,383; Cl F15D 1/02, Appl 6 Jul 1973, Discl. 22 Apr 1976, Assignee: Gas Proekt-Izyskat i N-I In-t Grazhd Aviatsii

The distinctive feature of this device is the hollow casing installed in the pipeline which contains a vibrator, eg, ultra-acoustic, whose active assembly projects into a section with the inlet and outlet branch pipes for the liquid.

483. Kurov VI, Kurchakov YuA, Lukin VA and Semenkin OA
LIFT MECHANISM FOR AN AERIAL LADDER
USSR Patent No. 499,394; Cl E06C 7/12, Appl 21 Jun 1974, Discl. 30 Apr 1976, Assignee: Osoboe Konstruktorskoe Byuoro Protivopozhar Tekh

The device contains a cage equipped with a removable monitor and a releasable hose connection and suspended from a traction rope coupled with a lifting winch. In order to increase the convenience of operation, the mechanism is provided with a lifting winch connected to the control winch and a device for attaching the cage to the steps of the ladder, the lifting and controlling winches being equipped with hydraulic servomechanisms.

8. FIREGROUND OPERATIONS

a. COMMUNICATIONS AND SIGNALLING

484. Geers H [*Bruges Fire Department, Belgium*]
CRITICAL EXAMINATION OF METHODS OF CALLING FIREFIGHTERS
Brass Malt Europe; 26(6-7):129-131, 1976 (French)

An analysis is made of the existing methods of reporting a fire to the fire service. A comparison is made of the efficiency of the various methods, such as direct verbal transmission to the station, street fire boxes, public community siren, public telephone system, direct telephone lines, radio telephone, automatic transmitter, and via security centers. The requirements of the different premises, the preferences of the fire service personnel (direct verbal communication), the economic aspects of the different methods, and other factors bearing on rapid communication of information on the outbreak of a fire are discussed.

485. Baker R and Subia V [*Huntington Beach Fire Dept, CA*]
SOLVING YOUR PROBLEMS BY UPDATING YOUR COMMUNICATIONS CENTER
Fire Command; 44(6):32-35, 1977

Response times are cut from 8-12 min to 3-5 min by the joint computer-aided dispatch center of four small-city fire departments serving 13 fire stations. The core of the center is a computer that formats the screen of the cathode ray tube display, monitors the status of vehicles, and handles teleprinter transmissions over the fire department radio frequencies. It also handles dispatch and message-switching functions for the police department, as well as status-, incident-, and dispatch-displays unique to police administrative situations. Establishment of the system, incident processing, and the radio networks are described. 3 photos.

486. Coleman CW
COMBINED COMMUNICATIONS CENTER DISPATCHES EMERGENCY SERVICES
Fire Command; 44(6):24-25, 1977

The combined communications center of Lehigh County, Pennsylvania, which provides services for 31 fire departments, 11 ambulance corps, and 9 police departments, is described. The operations of the center, which is manned by 10 dispatchers, two always on duty, and the procedures used in handling a call are outlined. The status of the fire departments is maintained on a map in front of the dual-position dispatcher station. Lights indicate that firefighters from several departments may be busy at two simultaneous fires. A screen displays local information, which is obtained manually by dispatchers from a microfiche file. 1 photo.

487. Hill J [*Salem Fire Dept, OR*]
EMERGENCY COMMUNICATION WITH THE DEAF
Fire Command; 44(6):38-39, 1977

Teletypewriters connected to regular telephones by a coupler enable dispatchers in a communications center serving three fire departments to conduct two-way conversations with local deaf students at the Oregon State School for the Deaf on a regular basis, thus ensuring quick response of emergency services. 2 photos.

b. EVACUATION AND RESCUE

c. HYDRAULICS AND WATER FLOWS

488. Muraki S
EMERGENCY POWER SOURCES FOR FIRE PUMPS
Denryoku to Tetsudo; 26(9):15-19, 1976 (Japanese)

The structure, design and operating principle, along with a classification and tactical-technical parameters of mass-produced Japanese power sources for fire pumps are described. Among these sources are electric motors, diesel- and gas-powered generators, dry cells and d-c batteries. In particular, the inventory of specialized electric motors provided with specialized drive systems includes 12 models with the following power ratings: 10, 20, 30, 35, 55, 75, 100, 125, 155, 175, 210 and 250 kVA. The main requirements for the operating conditions of emergency electric power sources are formulated. The test monitoring and measurement setup for recording the operating characteristics during periodic tests of the different equipment is described. Also given is a description of the design and operating principle of an automatic commutator for connection to the pump of the reserve power source in case the main source fails or in case the voltage in the network drops. The use of dual power sources in accordance with the new fire legislation for fixed fire-extinguishing systems is obligatory. 6 figs, 5 tables. (RZh)

489. Ueno O, Enomoto K, Asano Y and Horii K
STUDY OF WATER HAMMER PHENOMENA
Fire Sci Lab Japan. Rep; (13):110-115, 1976 (Japanese)

The methods and results of studies to determine the conditions of occurrence of a surge wave (water hammer) and its parameters as a function of the air entering the pipeline are described. As a result, there is an abrupt drop in pressure at the outlet of the pipeline, accompanied by a comparatively strong hydraulic and acoustic shock. Sometimes this phenomenon makes it difficult to extinguish fires, especially when the playpipes are rigidly fixed in a certain position by means of stands and the stream of water or extinguishant is directed at a fixed sector. In this case the effects of the water hammer are to upset the holder-stand and to inflict injuries on persons in the vicinity. Parameters such as the diameter of the fire hose and of the playpipe attachment, the length of the hose and the pressure developed by the pump were varied during the studies. It was found that the probability of appearance of the water hammer increases when the fire hose is twisted in different planes. The results of the research are presented in the form of graphs and tables. 11 figs, 2 tables. (RZh)

d. OPERATIONAL PROBLEMS: COMMAND AND CONTROL

490. Meinert EA [*Berlin Fire Dept, FRG*]
USE OF BREATHING APPARATUS BY NON-PROFESSIONALS
Brandschutz; 31(4):103-104, 1977 (German)

A fire in a farmyard in a Berlin (FRG) suburb confronted the unaccustomed urban firefighters with a situation they could not handle; they were unable to budge the bulls out of their stalls in the burning barn. The farmer and the milker were induced to don breathing apparatus in order to finish up the rescue action, which was successfully accomplished. In hindsight this measure can be considered correct and beneficial, but only because the rescue action was successful. The question is: what would have been the consequences had these untrained persons come to harm? It is emphasized that it is too risky to allow unskilled persons to use breathing apparatus. 2 figs. (Fachdok 13/0693)

491. Rathje A, Hauschildt H and Julga J
HAMBURG FIRE DEPARTMENT: HIGHRISE BUILDING FIRES
Brandschutz; 31(2):37-46, 1977 (German)

Three apartment fires in Hamburg (FRG) highrise buildings, one one the 9th, one on the 11th, and one on the 13th floors, are reported by the above authors, respectively. These reports were written specifically for the purpose of gathering experience in fighting highrise fires in order to develop a particular concept of highrise fireground operations. The location, structural features of the fire premise, and the firefighting measures are described. In conclusion, considerable room is given for a presentation of all the favorable factors found for firefighting and of all conditions in need of improvement. 22 figs. (Fachdok 13/0533)

e. SPECIAL EQUIPMENT

492. Schwanke J
THE REMOTE-CONTROLLED "WENDELIN"
Fahrzeug Kaross; 29(9):25, 1976 (German)

A description is given of a 3-section, articulated, automatic fire-hose boom mounted on a special chassis that can be elevated up to 30 meters, rotated 360°, and operated by a single operator. The nozzle at the top of the boom can deliver 5,000 ℓ/min water or 600 m^3/min low-expansion foam. Depending on wind conditions, the effective height of the jet is 60-80 m for a range of 80-120 m. The new fire apparatus is capable of delivering 6 times as much as a conventional apparatus with double the ordinary effective radius. 1 photo.

493. Barger SG, Guattery MP , Walker JJ and Watters DT [*Union Carbide Corp, Chemicals and Plastics Div*]
PLANT FIRE EMERGENCY VEHICLES
Fire J; 71(1):25-29, 1977

The criteria required to assess the need for fire emergency vehicles in chemical and plastics plants and to better understand and control the financial costs involved are presented. The six criteria discussed in the article are: basic needs for automotive equipment; determination of the need for fire truck pumpers; determining the need for motorized special fire-fighting equipment; multiple equipment considerations, such as exposures, current on-site equipment, availability of mutual or municipal aid, water supply augmentation, distance and routes to exposure, availability of manpower, past fire experience, reliability of equipment, and additional garage and service facilities; and criteria for replacement. The article concludes with a review of new truck equipment and apparatus.

494. Anon
SPECIAL PRIMUS-MINIMAX FIRE APPARATUS
Oesterr Feuerwehr; 30(11):218, 1976 (German)

An overall view and description of the Primus-Minimax fire apparatus of the Oesterreichischer Feuerschutz Company (Austria) for military airport service are given. These vehicles are designed for foam and powder fire extinguishing. The vehicle contains a 500 kg powder tank and a 350 ℓ foam tank. A rotatable reel with two fire hoses, each 30 m in length, forming a single line with a composite pistol nozzle, is mounted on the rear of the vehicle. This nozzle can deliver powder at a rate of 5 kg/sec and foam at 3.5 ℓ/sec. 1 fig.

f. TACTICS

495. Anon
ESSENTIALS OF FIRE FIGHTING
Fire Protection Publications, Oklahoma State Univ, Stillwater, OK; 1st edit, 360+ pages, 1977

This firefighter's handbook of fire suppression has been especially designed for students in fire service training programs and is based on the NFPA Standard 1001, "Fire Fighter Professional Qualifications, 1974," particularly the objectives set forth in levels I and II of this standard, with the exception of those objectives concerning fire department organization and first aid, which are covered in the companion texts, IFSTA 202 *Fire Service Orientation and Indoctrination* and IFSTA 109 *Fire Service First Aid Practices*. Over 700 photographs and illustrations show complete step-by-step details for evaluations. Included in the manual are the basics of hose, ladders, fire streams, forcible entry, rescue, salvage and overhaul, ventilation, fire behavior science, ropes and knots, extinguishers, protective breathing, fire prevention, fire cause identification, ground cover, communications, water supplies, and sprinkler systems, in 16 chapters. This volume is numbered IFSTA 200 in the International Fire Service Training Association's series of publications.

496. Bahme CW
FIRE OFFICER'S GUIDE TO EMERGENCY ACTION
NFPA, Boston, MA; 270 pages, 1976

This recently revised edition gives fingertip guidance to hundreds of emergency situations listed alphabetically for instant reference. Included are new material on plastics, air cushion restraints in vehicles, and fires involving chimneys, foundries, television sets, and oil burner malfunctions.

497. Purington RG and Patterson HW
HANDLING RADIATION EMERGENCIES
NFPA, Boston, MA; 184 pages, 1977

This book, written by the Fire Chief and the head of the Hazards Control Department at the Lawrence Livermore Laboratory in California, is intended for members of the fire service as well as personnel in industrial fire brigades, health services, and research facilities who may one day be confronted with a radiation emergency. The fundamentals of radiation hazards are presented with helpful guidance on pre-emergency planning and training, emergency procedures, rescue, and first aid. A list of various other sources of information is provided. The book can be used as a reference, training, or teaching tool.

498. Kallenbach J
PRINCIPLES FOR FIREGROUND OPERATIONS AT HIGHRISE BUILDING FIRES
Brandschutz; 31(2):33-36, 1977 (German)

In order to develop workable principles for fighting highrise fires based on experience, the Hamburg (FRG) fire department organized, in 1975, a working committee made up of representatives from the fire-prevention, operations, technical and training divisions, as well as from the security services. The results were synthesized as "Principles for Fireground Operations at Highrise Building Fires" and are presented in this article. The features of highrise fireground operations are considered using the firefighting regulations, so that special operating tactics have evolved. It is pointed out that these principles are tailored for the conditions prevailing for the Hamburg fire department and are not straightforwardly transferable. (Fachdok 13/0509)

499. Goodwin M [*Madison Area Tech College, WI*]
BLITZ ATTACK REALLY WORKS, TEST FIRES IN BUILDINGS SHOW
Fire Eng; 130(4):32-34, 1977

The blitz attack, a method of fighting fire in an extensively involved structure with a limited water supply, as often occurs in rural areas, is described. This tactic requires the use of large hand lines, usually 2 1/2-inch, with combination fog nozzles and sometimes pre-connected master streams. The theory of the blitz is to commit the water in the tank of the first-arriving pumper to extinguishing the fire, thereby protecting exposures, effecting rescues, and salvaging belongings in the structure.

500. Griffin R [*British Min Defence, Navy Dept, UK*], Koppert AV and Huber FD
AIRCRAFT FIRE-FIGHTING TACTICS
Fire Internat; 5(54):77-83, 1976 (English, French, German; Spanish Summary)

Several aspects of aircraft fire-fighting tests are discussed is this report, which covers contributions from Great Britain, the Netherlands and the United States. The need for airport fire and rescue personnel to be made fully aware of the dangers encountered in military aircraft is emphasized in the first contribution (Griffin). The military aircraft hazards are identified as weapons, cockpit/engine intake area, jet exhausts or rocket pod areas, and others. A cheap fire-fighting unit for smaller airports of the lowest category that was developed in the Netherlands is described in the second contribution (Koppert). The unit is a twin-agent AFFF-dry chemical device with a combined hose and pistol for one-man operation. Some experiences in Dutch airports are reported. A "survival support device" consisting of air compressed into tubing and released into a plastic hood pulled over the head is described in the third contribution

(Huber). (This article is an amalgamation of several papers presented at an International Aircraft Rescue and Firefighting Seminar held in Geneva, Switzerland, in September 1976.)

501. Lankajtes J
FIRE EXTINGUISHING OPERATIONS IN HIGHRISE BUILDINGS
Przege Poz; 64(11):8-9, 1976 (Polish)

The greatest attention is devoted to problems of evacuating people from highrise buildings involved in fires. The primary mission of the firefighting units when they reach the fireground is to make sure the elevators are working and to evacuate people from the most hazardous zones. If it is not possible to evacuate people by elevator and if the fire has cut off the upper floors of the building, ladders set up on the roofs of adjacent buildings are sometimes used. If the roof of the burning building has an area suitable for a helicopter landing, it can be used successfully not only to deliver firefighting equipment and firefighters, but also to evacuate people. Helicopters are often used to fight the fire directly from the air. Fire prevention in highrise buildings requires not only the development of individual plans for each building, but also modification of these plans when the fire protection teams work out their own measures. Also given are some recommendations to be considered in designing and operating highrise buildings. 1 fig. (RZh)

502. Zalewski Z
FIRE EXTINGUISHING TACTICS IN HIGHRISE BUILDINGS
Przege Poz; 64(11):3-5, 1976 (Polish)

An interview with the Commandant of the Warsaw Fire Service on aspects of extinguishing fires in highrise buildings is reported in this article. Considered were suppression of a fire in the initial stage and, in case it has developed, rapid and energetic extinguishment applying large numbers of firefighters and equipment. Some of the teams use elevators, stairs and stairwells to occupy a position above the fire zone and to prevent fire spread, to check ventilation and smoke removal systems, etc. A large part is played by operational fire-extinguishing plans for each building. The use of helicopters to extinguish fires and rescue people is ruled out at the present time, because the roofs of buildings are not suitable for landing helicopters. It is proposed to use helicopters to bring in firemen to organize fire-fighting operations and to rescue people from the upper portion of a building. In order to prevent the development and spread of fire, an important role is relegated to the implementation of suitable measures in the design stage. (RZh)

9. PLANNING

a. BUDGETING

503. Seward SM [*Washington State Univ, WA*], Plane DR and Hendrick TE
FIRE SERVICE LEVEL CAN BE SELECTED BY EVALUATING PUBLIC, PRIVATE COSTS
Fire Eng; 130(5):24-26, 28, 1977

In determining the amount of fire protection a municipality should provide, there is an important trade-off between the public costs of a fire department and the private costs of fire insurance. Illustrated in this article is the use of mathematical methods which set a lower bound on the amount of fire services a city should provide. This is done by finding the point at which the sum of the public and private costs is minimized. 1 fig, 2 tables.

504. Taliaferro JH [*Charlottesville Fire Dept, VA*]
ZBB — A LOGICAL LOOK AT BUDGETS
Fire Eng; 130(7):28-29, 1977

Many fire departments are currently operating under the management by objectives system, which is essentially composed of goals, objectives, and program activities defined in quantitative terms, such as time, quantity, and cost. Discussed in this article is a budgeting technique known as zero-base budgeting, or ZBB, a process which requires justification of every dollar of a department's projected expenditures for the fiscal period.

505. Nakagawa T, Matsukawa W, Hashegawa I, Akaogi I and Oyama S
TESTS ON DROPPING OF EXTINGUISHING AGENTS FROM HELICOPTERS
Fire Sci Lab Japan. Rep; (13):127-134, 1976 (Japanese)

The methods and results of tests aimed at determining the relationships between different parameters of the process of spraying extinguishants from a helicopter are described. The extinguishants were water and water with a 0.2 and 0.3% concentration of thickening agent. Production line helicopters of Japanese manufacture (types SA 330F, JA 9071 and JA 9121) and a specialized US-produced helicopter (Alouette III) designed for the extinguishment of fires in large installations from the air were used. The following parameters were varied within a broad range in these tests: the quantity of extinguishant (from 70 to 3600 liters), the helicopter altitude (20 to 100 m), the helicopter speed while spraying (0 to 100 km/hr), the size and configuration of the ground surface to be blanketed with extinguishant, the wind speed, air temperature, and other atmospheric and meteorological parameters. Contour diagrams illustrating the dependence of the intensity of blanketing and the shape of the ground sectors effectively blanketed with extinguishant as a function of combinations of the above-mentioned parameters were compiled from the test results. Also given is a comparative evaluation of the efficiency of the helicopters used in these tests in extinguishing the various kinds of fires. 8 figs, 8 tables. (RZh)

b. LOGISTICS

506. Monarchi DE, Hendrick TE [*Univ Colorado*] and Plane DR
SIMULATION FOR FIRE DEPARTMENT DEPLOYMENT POLICY ANALYSIS
Decis Sci; 8(2):211-227, 1977

This paper discusses the use of simulation in the determination and analysis of alternative deployment strategies for urban fire suppression systems. The simulation model utilizes the New York City-Rand Institute simulator of

. PLANNING

. Logistics—Continued

ire department operations tailored for use with the enver Fire Department. A distinction is made between tatic deployment (where mathematical programming ethods are used) and dynamic analysis (which employs he simulation model). The simulation model is described, s are its extensive data requirements. The results discuss easures of validation of the simulation and outline the ecommendations resulting from this research. 9 figs, 6 efs. (Author)

c. OPERATIONS ANALYSIS

507. Anon
PROBLEMS OF ECONOMICS IN FIRE PROTECTION [Voprosy Ekonomiki v Pozharnoy Okhrane]VNII Protivopozhar Oborony, Moscow, USSR; 102 pages, 1976 (Russian)

Considered in this fifth issue of a series being published by the All-Union Fire Protection Research Institute (Moscow, USSR) are various aspects of the use of mathematical methods to solve problems, to assess the fire hazard of premises of the national economy, to evaluate fire-service activities, to model operational situations, and to allocate emergency services. Problems involving the economic basis for the fire protection of buildings, predicting the technical parameters of fire apparatus and equipment, and determining the value of awards to be presented in accordance with the significance of inventions are discussed. A model of an automated system of managing fire brigades is described. (RZh)

508. Jackson M [*Springdale Fire Dept, AR*]
A CHIEF'S VIEW OF MASTER PLANNING
Fire Chief; 21(5):24-26, 1977

Springdale, Arkansas, was the first city to finish its community master plan under the validation program of the National Fire Prevention and Control Administration (NFPCA). In this article the Chief of the Springdale Fire Department discusses the process and offers suggestions to other chiefs who are considering community master plans in the future. Several important suggestions are advanced regarding makeup of the advisory (steering) committee and the planning project team, whose leader should be the fire chief. It is advised that help be sought from someone trained in formal comprehensive planning. Planning according to the NFPCA's Community Fire Protection Master Planning Manual is judged to be complex, but it is emphasized that perseverence will pay dividends.

509. Eichelberger P [*Miami Planning Dept, FL*] and Farren T
MIAMI USES STATION LOCATOR MODEL TO PREPARE 10-YEAR MASTER PLAN
Fire Eng; 130(6):30, 33, 1977

A fire station location model assists the Miami Fire Department in the preparation of its 10-year fire master plan. The Rand Corporation's firehouse site evaluation model is based on four basic assumptions: 1) fire units are always available in their stations to respond to emergencies; 2) the closest unit is always dispatched to an incident; 3) travel distances between two locations can be estimated using one of two mathematical formulas; and 4) travel time can be calculated from travel distance. The implications of these assumptions are discussed, as are the potentials of the model in evaluation of locations, addition of new apparatus, etc.

510. Heath RL [*Dept Planning and Dev, Minneapolis, MN*]
SYSTEMATIC PLANNING YIELDS UNEXPECTED SPIN-OFF BENEFITS
Fire Eng; 130(4):34-35, 1977

New approaches to more effective operation that were not a conscious subject of an initial planning program are described. Such spin-offs resulted from a recent computer-assisted study of fire station location. Among these spin-offs were: 1) new ways of looking at the city's fire hazards; 2) ideas for more effective fire prevention inspection activities; 3) new approaches to first-alarm response assignments; 4) improved interagency cooperation; 5) better understanding of public versus private responsibilities for fire protection; 6) an improved fire department image; and 7) agreement on the need for a more comprehensive master plan for the fire service. 1 fig.

511. Plane DR and Hendrick TE [*Univ Colorado, Boulder, CO*]
MATHEMATICAL PROGRAMMING AND THE LOCATION OF FIRE COMPANIES FOR THE DENVER FIRE DEPARTMENT
Oper Res; 25(4):563-578, 1977

An operations research study of fire company location in Denver, Colorado, has been conducted, resulting in recommendations that may reduce annual costs by more than $1 million without a substantial change in the level of fire-suppression capability. One development resulting from this study is a hierarchical objective function for the set-covering problem; this objective function permits the simultaneous minimization of the number of fire stations and the maximization of the number of existing fire stations within the minimum total number of stations. This paper includes discussions of the use of mathematical programming, station configuration information models, the synergism of judgment and analysis, and the action that resulted from the recommendations. 1 fig, 4 tables, 12 refs. (Author)

512. Hutchison PA, Sr, Rubin CB, Stevenson LA, Croce C and Barnes ES
ASSESSMENT OF THE TRANSFERABILITY OF THE COMMUNITY FIRE MASTER PLANNING PROGRAM.
Internat City Manage Assoc, Washington, DC; Unnumbered Report, 113 pages, Jun 1977
Availability: NFPCA

This report describes a project carried out by the International City Management Association (ICMA) during the period April 1976 to June 1977 for the National Fire Prevention and Control Administration. The ICMA project was a component of the Validation Phase of NFPCA's "Long Range Planning for Fire Services" program, and was performed under Grant No. NFPCA 76014. The ICMA project ran concurrently with, but independent of, a second component of NFPCA's fire planning program, which was directed and separately reported by a project team from the cities of Los Angeles and Mountain View, California, and Mission Research Corporation, their technical consultant. The findings and recommendations of the ICMA Fire Panel, a group of appointed and elected local government administrators organized to carry out the project reported on here, are to be used in future user materials being prepared by the Fire Administration for public release later this year. The report describing the ICMA project, as well as its findings and recommendations, is presented in three parts: Part I describes the objective of the ICMA assessment project and the project's relation to the master planning process, the methods and procedures designed by the ICMA staff to achieve that objective, and the activities of the staff and ICMA Fire Panel to carry out the project. Part II presents general considerations of the panel concerning the process as a whole, as well as an overall assessment of the planning manual developed to communicate that process. Part III gives the panel's recommendations both on specific areas of the planning manual and several aspects of the master planning program as a whole that the panel found to be of special concern.

513. Sitterley TE, Miller JE and McAllister GK
NATIONAL FIRE SERVICE SYSTEM REQUIREMENTS ANALYSIS. PHASE II: TEST AND VALIDATION OF THE ANALYSIS PROCESS. FINAL SUMMARY REPORT.
Washington State Coord Council for Occup Ed, Fire Service Training, Olympia, WA; Unnumbered Report, 81 pages, Nov 1975
Availability: NTIS PB-266 510/7GA

This report provides a brief overview of the Fire Service System Requirements Analysis Project from its inception to the present. It covers the project background, which includes the history, phasing, technical approach and the organizations that have participated in the project. It describes the mechanics of the system requirements analysis process, including the system analysis training of the participants, the data collection procedures, and evaluation results. Application of the requirements data is described, including the data format, local and national application, the data acquisition/dissemination process, and potential applications.

514. Sitterley TE, Prendergast ER, Hay OA and Jensen LR
NATIONAL FIRE SERVICE SYSTEM/TASK ANALYSIS. PHASE I: DEVELOPMENT OF THE ANALYSIS PROCESS. FINAL REPORT. Washington State Coord Council for Occup Ed, Fire Service Training, Olympia, WA; Unnumbered Report, 99 pages, Jan 1975
Availability: NTIS PB-266 509/9GA

This report presents a basic systems/task analysis methodology for identifying and obtaining personnel, equipment, and task environment requirements data. Fire department functions are identified and analyzed to provide a common framework or structure from which fire service requirements data may be obtained throughout the nation. A standardized task analysis approach and worksheet were developed to provide for efficient data collection and application. The overall process is illustrated by a firefighting task analysis example.

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

[For more complete coverage of the behavioral and medical literature see: ***Psychology Abstracts*** and ***Index Medicus***.]

a. ARSON

515. Anon
SEATTLE ARSON TASK FORCE — IMPLEMENTATION PROGRAM
City of Seattle, WA; 156 pages, 1976

This booklet was prepared in an attempt to acquaint the public with Seattle's Task Force on Arson and the steps taken to implement the project. Starting with an article published in the September, 1975, issue of *Fire Command*, the problem is shown as it existed when the Task Force was organized, the steps taken to correct the situation, and the results of the first year of operation. The booklet includes 14 sections: the first report of the Mayor's Task Force on Arson; organization charts; training program outlines; a brief report on law enforcement involvement; a fire prevention patrol report on combat firefighter utilization; an account of the Juvenile Referral Service with juvenile interview form; a report on fire problems in Seattle schools; statistics on vehicle fires with an automobile fire inspection check list; an outline of the insurance industry cooperation; the Seattle/King County Arson information retrieval source; the second report of the Mayor's Task Force on Arson; an analysis of arson in a socio-economic framework, a research proposal by the Institute for Puget Sound Needs; and a report on "Effective Public Relations" with illustrative newspaper clippings.

516. Anon
ARSON — A NATIONAL DISEASE
Fire; 70(866):134, 1977

A report is made on the papers presented at a conference on the growing problems of vandalism and arson in industry and commerce and the management of risks sponsored jointly by the British Insurance Association and the Fire Protection Association. The points brought out at the conference related to the latest crime statistics, which showed a worsening of the situation, though the statistics probably do not reveal the full extent of incidences. It is believed that when arson is involved, the pattern of growth might be accelerated beyond normal. The need for security and fire protection to be planned together is emphasized. It is suggested that the incentive to commit acts of malicious damage originated from boredom created by the monotony of industrial production and the lack of stimulus to use spare time profitably. In view of the increase in number of public property fires since the early 1970s, the protection of institutional risks is a paramount problem. It is concluded that a reduction can be achieved only where there is cooperation of the population at large.

517. Estepp MH and Caddington WW [*Prince George's Cty Fire Dept, MD*]
ORGANIZING TO FIGHT ARSON
Fire Command; 44(5):20-21, 1977

The operations of the Fire Investigation Division of the Bureau of Fire Prevention and Special Operations of the Prince George's County Fire Department in Maryland in fighting arson by saturating arson areas with investigative personnel are outlined. The department's anti-arson effort attempts to prevent arson by analytic programs and investigates those arson incidents that do occur promptly and thoroughly. A Special Case Assignment Task Force (SCAT) assists in closing major unsolved cases. The Major Operations Detail (MOD), a team of off-duty members of the fire-suppression force, assists the Investigations Division when manpower needs exceed normal division resources. 2 photos.

518. Hurteau WK [*Property Loss Res Bur, Investigation Service*]
WAS THAT AN ARSON FIRE?
Fire Command; 44(8):30-31, 1977

Fires set to defraud insurance companies usually are not hard to detect because in most cases they are planned in advance and are set to achieve a specific objective, ie, they are set in a logical way and can be solved logically by the investigator. The steps taken by the investigator in following through on this premise, such as checking the building, use of scientific techniques (chromatograph, microscope, fingerprints), and determination of the firesetter (materials burned, accelerants used, building security, manner in which the fire was set), are detailed.

519. Bryan JL [*Univ Maryland, Fire Prot Curriculum*] and Icove DJ
RECENT ADVANCES IN COMPUTER-ASSISTED ARSON INVESTIGATION
Fire J; 71(1):20-23, 1977

During three years of development, the technique of arson pattern recognition (APR) has proved to be an effective incendiary crime indicator and deterrent. APR is a systematic intelligence analysis tool for use by the arson investigator in the detection, prediction, and prevention of incendiary crimes. With APR predictions of where and when incendiary crimes will most likely occur, the arson intelligence analyst can assign investigators to these areas for patrol and surveillance activities. For multidimensional correlations involving hundreds of fires over several years, computer-aided arson pattern recognition systems can be effective tools for the arson investigator. 4 figs, 2 photos, 2 tables, 6 refs. (NFPA)

520. Anon
INCENDIARISM: AN FM SURVEY
Record; 54(4):12-15, 1977

Factory Mutual initiated a survey at the last International Association of Fire Chiefs conference to determine, first, how fire departments across the country perceive the problem of incendiarism, and, secondly, what they are doing about it. It is hoped that by sharing the ideas and experiences of fire departments in many separate communities, other communities will be able to combat the problem for themselves more effectively. A brief discussion concerns the sample group, investigating units of the sample group, areas of concentration to combat incendiarism, potential assistance on the part of the insurance industry, and the survey follow-up. Representative responses from 6 fire departments across the country are included. A copy of the complete survey is available at no charge.

b. COMBUSTION TOXICOLOGY

521. Terrill JB, Montgomery RR and Reinhardt CF [*EI du Pont de Nemours and Co, Haskell Lab for Toxicol and Ind Med*]
DEVISING A SCREENING TEST FOR TOXIC FIRE GASES
Fire Technol; 13(2):95-104, 1977

Small-scale laboratory tests using externally applied heat will not define the life hazard in most real fire situations. However, such tests are a first step in screening comparable materials. The ideal test should simulate significant real conditions; provide fast, accurate answers; use inexpensive equipment; require nonskilled operators; be cheap to run; give animal results without using animals; use material in any form; require less than 10 grams of material; and be reproducible. The performance of material under a series of appropriate test conditions and procedures should be more beneficial than a single test. 8 figs, 9 refs. (NFPA)

522. Hilado CJ, Lopez MT [*Univ San Francisco, CA, Fire Saf Center*] and Damant GH
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS FROM SOME UPHOLSTERY FABRICS
J Coated Fabrics; 6(3):155-175, 1977

Twenty-two samples of upholstery fabrics used in home furnishings were evaluated for relative toxicity by means of the USF/NASA toxicity screening test. This test appears suitable for discriminating between these materials, on the basis of time to first sign of incapacitation (Ti) and time to death (Td) under a fixed set of test conditions. The upholstery fabrics exhibited varying degrees of toxicity under pyrolysis conditions. The polyester and wool fabrics exhibited the shortest times to death. Samples of six different colors from the same fabric were evaluated separately. There appeared to be no significant effect of fabric dye on relative toxicity, for this material under these test conditions. 2 figs, 5 tables, 36 refs. (Author)

523. Adams SI [*Union Carbide Corp, South Charleston, WV, Res and Dev Dept, Safety Res Lab*]
ANALYSIS OF COMBUSTION GASES DURING TESTING WITH THE NBS SMOKE CHAMBER
J Combust Toxicol; 4(3):360-366, 1977

A second generation method for characterizing selected combustion products during routine tests was developed utilizing the NBS Smoke Density Chamber, with data reduction based on sample weight loss. This work is an initial effort in a long-range program to develop a system for routinely analyzing gases from the burning of various materials and to relate the concentrations of the various species to the combustion process and the material tested. Knowledge of the species concentration and their toxicity will guide research in the production of safer building materials and furnishings. Five samples representative of materials found in the home were tested: hemlock, wool, brominated polyester, polyvinyl chloride, and a rubber foam. The wood and wool products were tested to establish a "benchmark" to which polymer products can be compared. High levels of carbon monoxide and carbon dioxide were produced by each of the samples. Correlating the composition of the gases evolved with the composition of the samples tested, giving rise to the possibility of controlling toxic gas emissions by proper selection of materials. 3 tables, 3 refs. (Author)

524. Dressler DP [*Harvard Med School, Cambridge, MA, Surg and Anesth Res*], Robinson RS, Stone JP, Williams FW and Carhart HW
BIOLOGICAL EFFECT OF FIRE SUPPRESSION BY NITROGEN PRESSURIZATION IN CLOSED ENVIRONMENTS
J Combust Toxicol; 4(3):314-324, 1977

Liquid fuel JP-4 fires have been successfully extinguished in confined spaces by nitrogen pressurization of pressures sufficient to reduce the percentage of oxygen to 10%. This oxygen percentage will sustain life as long as the partial pressure of oxygen remains constant. These experiments were conducted to test the effect of fire and nitrogen pressurization on the functioning of life organisms. Accordingly, a study was designed to assess what behavioral changes, including mortality, occur in laboratory animals due to smoke toxicity following extinguishment of a jet fuel (JP-4) fire by nitrogen pressurization. The experiments were conducted at the Naval Research Laboratory (NRL) using a two-man decompression chamber. Two hundred eleven Sprague-Dawley rats of standard weight were placed unanesthetized in individual cages and in running wheels to evaluate time of useful function (TUF). Ten runs were carried out with predesignated animals monitored for mortality, physiological functions, and pathological examination. JP-4, in a container in the chamber, was arc ignited and allowed to burn for various periods of time before nitrogen pressurization of two atmospheres with animals remaining in the chamber 15 minutes before depressurization. Of the 211 animals exposed, one died in chamber and one died 15 days post exposure. Although some of the animals in the TUF runs were not able to maintain their equilibrium during exposure to smoke, they all recovered. Except for transient effects during pressurization, there were no indications that nitrogen pressurization to two atmospheres with or without fire was harmful to the animals. 6 figs, 1 table, 9 refs. (Author)

525. Hilado CJ, Cumming HJ [*Univ. San Francisco, CA, Fire Safety Center*], Kourtides DA and Parker JA
SYSTEMS FOR ANIMAL EXPOSURE IN FULL-SCALE FIRE TESTS
J Combust Toxicol; 4(2):101-112, 1977

Two systems for exposing animals in full-scale fire tests are described. Both systems involve the simultaneous exposure of two animal species, mice and rats, in modular units; determination of mortality, morbidity, and behavioral response; and analysis of the blood for carboxyhemoglobin. The systems described represent two of many possible options for obtaining bioassay data from full-scale fire tests. In situations where the temperatures to which the test animals are exposed cannot be controlled, analytical techniques may be more appropriate than bioassay techniques. 2 figs, 4 tables, 8 refs. (Author)

526. Hilado CJ and Solis AN [*Univ San Francisco, CA, Fire Safety Center*]
SOME POSSIBLE REFERENCE MATERIALS FOR FIRE TOXICITY TESTS
J Combust Toxicol; 4(2):163-172, 1977

Suitable reference materials need to be selected in order to standardize any test method. The evaluation of cotton, polyethylene, polyether sulfone, polycarbonate, polystyrene, and polyurethane flexible and rigid foams as possible reference materials for the USF/NASA toxicity screening test method is discussed. 7 tables, 7 refs. (Author)

527. Hilado CJ and Cumming HJ [*Univ. San Francisco, CA, Fire Safety Center*]
A COMPARISON OF RELATIVE TOXICITY RANKINGS BY SOME SMALL-SCALE LABORATORY TESTS
J Combust Toxicol; 4(2):173-180, 1977

Small-scale laboratory tests for fire toxicity, suitable for use in the average laboratory hood, are needed for screening and ranking materials on the basis of relative toxicity. The performance of wool, cotton, and aromatic polyamide under several test procedures is presented. 5 tables, 15 refs. (Author)

528. Hilado CJ and Gall LA [*Univ. San Francisco, CA, Fire Safety Center*]
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS OF SOME WOOD SAMPLES
J Combust Toxicol; 4(2):193-199, 1977

Nine samples of wood provided by the Eastern Forest Products Laboratory of Canada were evaluated for relative toxicity using the NSF/NASA screening test method. The samples of hardwoods were aspen poplar, beech, yellow birch, and red oak. The samples of softwoods were western red cedar, Douglas fir, western hemlock, eastern white pine, and southern yellow pine. There was no significant difference among these nine wood samples with regard to relative toxicity under these particular test conditions. 1 fig, 2 tables, 7 refs. (Author)

529. Hilado CJ and Cumming HJ [*Univ. San Francisco, CA, Fire Safety Center*]
STUDIES WITH THE USF/NASA TOXICITY SCREENING TEST METHOD: EXERCISE WHEELS AND OXYGEN REPLENISHMENT
J Combust Toxicol; 4(2):200-205, 1977

Continuing efforts to improve the USF/NASA toxicity screening test method have included the addition of exercise wheels to provide a different measure of incapacitation and oxygen replenishment to offset any effect of oxygen depletion by the test animals. The addition of exercise wheels limited the number of animals in each test and doubled the required number of tests without any significant improvement in reproducibility. Oxygen replenishment appears to have an effect on survival in the last 5 minutes of the 30-minute test, but the effect is expected to be similar for most materials. 1 fig, 2 tables, 3 refs. (Author)

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

b. Combustion Toxicology—Continued

530. Hilado CJ and Cumming HJ [*Univ. San Francisco, CA, Fire Safety Center*]
EFFECT OF CARBON MONOXIDE ON SWISS ALBINO MICE
J Combust Toxicol; 4(2):216-230, 1977

Times to incapacitation and death and LC_{50} values were determined for male Swiss albino mice exposed to different concentrations of carbon monoxide in a 4.2 liter hemispherical chamber. These values are compared to values reported in the literature. The LC_{50} for a 30-minute exposure was 3570 ppm CO. 3 figs, 5 tables, 12 refs. (Author)

531. Hilado CJ and Machado AM [*Univ. San Francisco, CA, Fire Safety Center*]
EFFECT OF SULFUR DIOXIDE ON SWISS ALBINO MICE
J Combust Toxicol; 4(2):236-245, 1977

Times to incapacitation and death and LC_{50} values were determined for male Swiss albino mice exposed to different concentrations of sulfur dioxide in a 4.2 liter hemispherical chamber. The LC_{50} for a 30-minute exposure was about 3000 ppm SO(2). 3 figs, 3 tables, 5 refs. (Author)

532. Hilado CJ and Machado AM [*Univ. San Francisco, CA, Fire Safety Center*]
EFFECT OF NITROGEN DIOXIDE ON SWISS ALBINO MICE
J Combust Toxicol; 4(2):246-253, 1977

Times to incapacitation and death and LC_{50} values were determined for male Swiss albino mice exposed to different concentrations of nitrogen dioxide in a 4.2 liter hemispherical chamber. The LC_{50} for a 10-minute exposure was about 1000 ppm NO(2). 1 fig, 3 tables, 6 refs. (Author)

533. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
A BIBLIOGRAPHY OF PUBLISHED INFORMATION ON COMBUSTION TOXICOLOGY
J Combust Toxicol; 4(2):254-262, 1977

This eighth installment in the continuing collection of published information on combustion toxicology contains 110 new references, making a total of 829 references in this series of bibliographies. Though most of the new references are recent 1976 and 1977 material, some represent older material dating back to the 1940's.

534. Hilado CJ, Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*] and Packham SC
THE USE OF A BEHAVIORAL RESPONSE SYSTEM IN THE USF/NASA TOXICITY SCREENING TEST METHOD
J Combust Toxicol; 4(3):283-292, 1977

Relative toxicity data on the pyrolysis effluents from bisphenol A polycarbonate and wool fabric were obtained, based on visual observations of the behavior of free-moving mice and on an avoidance response behavioral paradigm of restrained rats monitored by an instrumented behavioral system. The initial experiments show an essentially 1:1 correlation between the two systems with regard to first signs of incapacitation, collapse, and death from pyrolysis effluents from polycarbonate. It is hypothesized that similarly good correlations between these two systems might exist for other materials exhibiting predominantly carbon monoxide mechanisms of intoxication. This hypothesis needs to be confirmed, however, by additional experiments. Data with wool fabric exhibited greater variability with both procedures, indicating possibly different mechanisms of intoxication for wool as compared with bisphenol A polycarbonate. 2 figs, 2 tables, 3 refs. (Author)

535. Hilado CJ, Cumming HJ and Gall LA [*Univ San Francisco, CA, Fire Safety Center*]
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS OF SOME BUILDING MATERIALS
J Combust Toxicol; 4(3):304-313, 1977

Fourteen samples of building materials were evaluated for relative toxicity using the USF/NASA toxicity screening test method. There appeared to be no major differences in relative toxicity under these conditions between different samples of cellulosic board products and roofing felts. 1 fig, 2 tables, 7 refs. (Author)

536. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
STUDIES WITH THE USF/NASA TOXICITY SCREENING TEST METHOD: CARBON MONOXIDE AND CARBON DIOXIDE CONCENTRATIONS
J Combust Toxicol; 4(3):376-384, 1977

In the USF (University of San Francisco)/NASA toxicity screening test method, gas samples of the chamber atmosphere are taken at the time to death of the last surviving animal. Because these analyses are essentially isolated spot values which provide no information about concentration trends, only limited conclusions can be based on these values. The carbon monoxide concentrations, however, may indicate the relative importance of carbon monoxide as a toxicant. 2 figs, 1 table, 5 refs. (Author)

537. Hilado CJ, Casey CJ and Furst A [*Univ San Francisco, CA, Fire Safety Center*]
EFFECT OF AMMONIA ON SWISS ALBINO MICE
J Combust Toxicol; 4(3):385-388, 1977

Times to incapacitation and death and LC_{50} values were determined for Swiss albino male mice exposed to different concentrations of ammonia in a 4.2 liter hemispherical chamber. The LC_{50} for a 30 min exposure was 21,430 ppm. 1 fig, 1 table, 4 refs. (Author)

538. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
VARIATION IN ANIMAL RESPONSE TO DIFFERENT TOXICANTS
J Combust Toxicol; 4(3):389-392, 1977

The variation in response of different lots of male Swiss albino mice to pyrolysis effluents from surgical cotton and from bisphenol A polycarbonate, and to pure carbon monoxide, is discussed. The variation appeared to be less with the pyrolysis gases from polycarbonate than with pure carbon monoxide. 2 tables, 3 refs. (Author)

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

b. Combustion Toxicology—Continued

539. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
RELATIVE TOXICITY OF PYROLYSIS PRODUCTS FROM UPHOLSTERY FABRICS: EFFECTS OF FABRIC VARIABLES AND TEST CONDITIONS
J Combust Toxicol; 4(3):393-414, 1977

Relative toxicity data on the pyrolysis products from 106 samples of upholstery fabrics are presented. The effects of fabric type, fabric weight, backcoating weight, and test conditions are discussed. The relative toxicity ranking, in order of decreasing toxicity based on time to death, was wool, silk, polyester, leather, cotton, rayon, nylon, and polyolefin. Among the wool fabrics, toxicity seemed to decrease with decreasing wool content. There appeared to be no significant effect of fabric weight, fabric weave, or backcoating. Relative toxicity test results were affected by temperature, heating rate, and air flow. Times to incapacitation and to death generally decreased with an increase in heating rate and with an increase in air flow. The relative toxicity rankings were to some extent sensitive to test conditions. Some materials, however, tended to rank consistently among the most toxic or least toxic materials. 1 fig, 10 tables, 19 refs. (Author)

540. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
A REVIEW OF LC_{50} DATA
J Combust Toxicol; 4(3):415-424, 1977

A compilation of available LC_{50} data on toxic gases encountered in fires is presented. Correlations and comparisons between gases and animal species are discussed. Extrapolation to humans on the basis of metabolic rate is explored. 2 figs, 4 tables, 12 refs. (Author)

541. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
A BIBLIOGRAPHY OF PUBLISHED INFORMATION ON COMBUSTION TOXICOLOGY
J Combust Toxicol; 4(3):425-429, 1977

One of the goals of the *Journal of Combustion Toxicology* is to so guide its content that within five years a complete collection of issues would be the basic literature source in this field of technology. Until this literature source comes into being, the researchers of today, working in a field so relevant to human life, must build on the information available to them now. To assist them in their important task, this bibliography of published information (49 items) was prepared, to continue the bibliographies published in earlier issues, which contained a total of 829 references from a wide variety of journals. The material dates mostly from 1977, some from 1976 and 1975, and a single entry from 1964. Previous compilations can be found in *J Combust Toxicol* 1(2):91-94 and 1(4):268-276, 1974; 2(1):113-117, 2(3):244-261 and 2(4):315-323, 1975; 3(2):189-195, 1976; and 4(2):254-262, 1977. (Author)

542. Hilado CJ, Cumming HJ, Machado AM, Schneider JE [*Univ San Francisco, CA, Inst Chem Biol, Fire Safety Center*], Crane CR, Sanders DC, Endecott BR and Abbott JK
COMPARISON OF ANIMAL RESPONSES TO THE COMBUSTION PRODUCTS GENERATED BY TWO TEST PROCEDURES, THE USF/NASA METHODOLOGY AND THE FAA/CAMI SYSTEM
J Combust Toxicol; 4(3):325-359, 1977

Samples of polycarbonate, polyethylene, polystyrene, and acrylonitrile-butadiene-styrene polymer were each used as the fuel in the USF/NASA test method under several test conditions, and as the fuel in the FAA/CAMI test method. The relative toxicity rankings of the test materials, as measured by animal response times, were highly dependent on the test conditions selected, and on whether animal incapacitation or death was used as the criterion. There appeared to be significant differences in results between the 600°C and 800°C upper temperature limits, and between no forced air flow, single-pass air flow, and continuous recirculation of the chamber atmosphere. None of the seven test programs with the USF/NASA method ranked the four materials in the same order as the FAA/CAMI method. The observers' subjective decisions concerning the test animals' behavioral responses appear to be consistent between the two test methods if time-to-incapacitation by the CAMI method is considered the same as time-to-collapse by the USF method, and time-to-death by the two methods is considered the same. 2 figs, 13 tables, 7 refs. (Author)

543. Hsu MT [*Univ San Francisco, CA, Fire Safety Center*]
ANALYTICAL METHODS FOR TOXIC GASES FROM THERMAL DEGRADATION OF POLYMERS
J Combust Toxicol; 4(3):293-303, 1977

Toxic gases evolved from the thermal oxidative degradation of synthetic or natural polymers in small laboratory chambers or in large-scale fire tests are measured by several different analytical methods. Gas detector tubes are used for fast on-site detection of suspect toxic gases. The infrared spectroscopic method is an excellent qualitative and quantitative analysis for some toxic gases. Permanent gases such as carbon monoxide, carbon dioxide, methane and ethylene, can be quantitatively determined by gas chromatography. Highly toxic and corrosive gases such as nitrogen oxides, hydrogen cyanide, hydrogen fluoride, hydrogen chloride and sulfur dioxide should be passed into a scrubbing solution for subsequent analysis by either specific ion electrodes or spectrophotometric methods. Low-concentration toxic organic vapors can be concentrated in a cold trap and then analyzed by gas chromatography and mass spectrometry. The limitations of different methods are discussed. 5 figs, 12 refs. (Author)

544. Potts WJ and Lederer TS [*The Dow Chem Co, Midland, MI, Toxicol Lab*]
A METHOD FOR COMPARATIVE TESTING OF SMOKE TOXICITY
J Combust Toxicol; 4(2):114-162, 1977

The methods described in this communication are based on the recognition that pyrolysis and combustion must be treated as separate phenomena in order to obtain reproducible laboratory results. The problem of avoiding fractionation of pyrolysis or combustion vapors while not overheating the chamber in which the animals are housed has been solved by development of a heating furnace designed specifically for this purpose. Rat mortality is used as the toxicity index, for this appears to be the most objective and reproducible method. This report gives the results of detailed studies, including dose-response data, of six cellulosic materials, three polystyrene formulations, and one low-density rigid urethane foam. Adaptations of the methods described herein are suggested for use as a simple screening test, suitable for the discovery of an unusual toxicity that might result from pyrolysis or combustion of a material of construction. 3 figs, 21 tables, 23 refs. (Author)

545. Stone JP and Williams FW [*Nav Res Lab, Washington, DC, Chem Div, Combust and Fuels Branch*]
TRANSPORT OF HYDROGEN CYANIDE BY WATER AEROSOL IN A SIMULATED FIRE ATMOSPHERE
J Combust Toxicol; 4(2):231-235, 1977

The hazard of respirable water droplets exposed to hydrogen cyanide (HCN) gas in a simulated fire atmosphere is judged small when compared to the threat of gas-phase HCN. 1 fig, 3 tables, 7 refs. (Author)

546. Tsuchiya Y [*Nat Res Council Canada, Ottawa, Canada, Div Build Res, Fire Res Sect*]
SIGNIFICANCE OF HCN GENERATION IN FIRE GAS TOXICITY
J Combust Toxicol; 4(3):271-282, 1976

Several components in combustion products of polymers are known to be or are suspected of being more harmful than CO for various conditions of combustion or thermal decomposition. HCN, one such compound produced from a variety of nitrogen-containing polymers, is discussed in this paper. Published data for animal exposure studies in which HCN may have played a major role and quantitative data for HCN generation are reviewed. The conditions of combustion, such as temperature and amount of oxygen, that affect generation of HCN, are discussed. Theoretical calculation of the equilibrium concentration of HCN is also presented and discussed in relation to experimental data. Significance of HCN generation in fire gas toxicity is shown by using the toxicity factor. Ranking of nitrogen-containing materials based on the propensity of toxic gas generation can be variable because the quantity of HCN generated varies widely depending on the conditions of combustion. 1 fig, 3 tables, 45 refs. (Author)

547. Hilado CJ and Cumming HJ [*Univ San Francisco, CA, Fire Safety Center*]
RELATIVE TOXICITY LISTING OF MATERIALS
J Consumer Prod Flammability; 4(2):188-198, 1977

Relative toxicity listings of materials evaluated by the USF and CAMI methods are presented, to provide up-to-date compilations of available data. 3 tables, 6 refs. (Author)

548. Loke J, Farmer WC, Matthay RA, Virgulto JA and Bouhuys A [*Yale Univ, New Haven, CT, School of Med*]
CARBOXYHEMOGLOBIN LEVELS IN FIRE FIGHTERS
Lung; 154:35-39, 1976

The occupational effect of carbon monoxide on blood carboxyhemoglobin levels (COHb) from smoke inhalation was studied in 51 firefighters. Non-smoking firefighters had a baseline mean blood COHb saturation higher ($P < .005$) than non-smoking controls, while there was no difference in the blood COHb between smoking firefighters and smoking control subjects. The blood COHb was repeated in 16 firefighters after three building fires and there was a significant increase ($P < .001$) in the mean blood COHb level over the baseline values. Firefighters should avoid cigarette smoking after a fire to prevent further increases in blood COHb levels. The use of the self-contained air breathing apparatus is protective against undue exposure to carbon monoxide during firefighting. 2 tables, 11 refs. (Author)

549. Raynaud FL, Audouin AA and Voury JM
STUDY OF THE ADDITIONAL INTOXICATION RISKS OF PLASTIC MATERIALS IN CASE OF FIRE
Rev Secur; 11(117):9-17, 1976 (French)

An examination is made of the mechanism of generation of toxic substances during the cumbustion of plastic materials and of the release of toxic substances by incombustible plastics during a fire in poorly ventilated spaces on board ships, in hangars and garages, stores, warehouses, residential buildings, auditoriums, and other public-access facilities. The materials of research work carried out in 1965-1966 are used. In conducting this research an effort was made to make the conditions as close as possible to actual conditions. Measurements were made in the presence of air at atmospheric pressure, since the presence of air has a considerable influence on the nature of combustion of plastics and the formation of toxic substances. 3 figs. (RZh)

550. Crane CR, Sanders DC, Endecott BR, Abbott JK and Smith PW
INHALATION TOXICOLOGY: I. DESIGN OF A SMALL-ANIMAL TEST SYSTEM; II. DETERMINATION OF THE RELATIVE TOXIC HAZARDS OF 75 AIRCRAFT CABIN MATERIALS. Fed Aviat Admin, Civ Aeromed Inst, Oklahoma City, OK; FAA AM-77-9, 49 pages, 28 figs, 4 tables, 13 refs, 1977
Availability: NTIS

In an effort to further the cause of increased safety for those who ride in commercial aircraft, this paper presents a detailed description of the genesis of a small-scale, laboratory test system that utilizes small animals to evaluate the relative toxic hazard of combustion products generated by the thermal decomposition of nonmetallic materials. It includes: a discussion of the concepts that led to the design; detailed instructions for fabricating the system; operating parameters and instructions for conducting a test; an evaluation of the system's performance as determined by the testing of 75 aircraft cabin materials; the utilization of animal response time as a basis for expressing relative toxicity; and a discussion of the derivation of an "inhalation dose" concept that promises to be more useful than "lethal concentrations." (Author)

551. Birky MM
HAZARD CHARACTERISTICS OF COMBUSTION PRODUCTS IN FIRES: THE STATE-OF-THE-ART REVIEW. Nat Bureau Standards, Inst Appl Technol, Center for Fire Res; NBSIR 77-1234, NASA CR-135088, 48 pages, 87 refs, May 1977
Availability: NTIS

The purpose of this effort is to review what is known about the "smoke inhalation" hazard as related to human fatalities, the limitations of the fire fatality data and the methods that have been and are being used to assess the inhalation toxicity hazard. Fire statistics indicate that 70 to 80% of the fire fatalities are attributed to smoke inhalation. In-depth autopsy studies of some of these fatalities show that carbon monoxide is the predominant toxicant produced from fires. The role of new synthetic polymers and other additives is unknown, as is the role of hydrogen cyanide in fire fatalities. Chemical analysis of combustion products has been used extensively to assess the toxicological hazard in fire research. The limitations of such measurements are addressed and a combination of toxicology (animal exposures) and analytical chemistry is recommended. Recent combined biological and selected analytical measurements are critically reviewed. The mechanism of toxic action of a few well-known combustion products is discussed. Due to the extensive use of organophosphates as fire retardants in polymeric materials, the toxicity of this class of compounds is reviewed in some detail. The role of building codes and standards and early detection and suppression of fire are discussed as a means of reducing human exposure to toxic combustion products. For example, the 1976 French regulation that limits the use of flammable materials that contain chlorine and nitrogen in their molecular structure is presented. (A bibliography of 87 items is appended.) (Author)

552. Crockett PW
TOXICITY OF GASEOUS HALOGENATED ORGANIC COMPOUNDS (A BIBLIOGRAPHY WITH ABSTRACTS). Nat Tech Inf Service, Springfield, VA; NTIS PS-77/052/3GA, 183 pages, Jun 1977
Availability: NTIS

Subject areas include toxicological studies on halogenated hydrocarbons used as fire extinguishers, anesthetics, solvents, pesticides, and aerosol propellents. (This updated bibliography contains 178 abstracts, 90 of which are new entries to the previous edition.)

553. Sumi K and Tsuchiya Y
EVALUATING TOXICITY OF DECOMPOSITION PRODUCTS FROM ANALYTICAL DATA. Nat Res Council Canada, Div Build Res, Fire Res Sect, Ottawa, Canada; DBR Paper 711, 8 pages, Mar 1977

Research on fire toxicity undertaken by the Fire Research Section of the National Research Council of Canada is presented. Work to date has been directed towards quantitative analysis of decomposition products and subsequent assessment of toxicity. The fire toxicity concept proposed by the authors provides indications of the relative importance of toxic species produced from a given material, and the propensity of materials for generating toxic decomposition products. (Paper published in *Proceedings of the 1976 International Symposium in Flammability and Fire Retardants*, pp 241-248.) (Author)

554. Anon
FIRE TOXICOLOGY: METHODS FOR EVALUATION OF TOXICITY OF PYROLYSIS AND COMBUSTION PRODUCTS. REPORT NO. 2. Nat Res Council Canada, Committee on Fire Toxicol; Unnumbered Report, 34 pages, 1 fig, 2 tables, 50 refs, Aug 1977

This report briefly describes most of the current methodologies used to investigate the toxicity of pyrolysis and combustion products. Although many gaps in the scientific knowledge must be filled before protocols for standardized screening methods can be written on a scientifically sound basis, the committee has recommended guidelines for developing screening systems. These guidelines limit the number of variables in a screening method in three major areas: burn conditions, exposure conditions, and end points. Detailed recommendations cannot always be made due to the state-of-knowledge. For example, the committee considers the measurement of incapacitation to be the most important end point; however, no one method can be recommended at this time. This report points out these areas in which research is needed. They are important for developing the basis for fire toxicology screening systems, and are not an inclusive list of research needs in the general area of fire toxicology. This document is directed toward those persons in government and industry who are primarily concerned with reproducible standard methods for screening materials for fire toxicity. (Author)

555. Jenkins LJ, Jr, Jones RA and Anderson ME
THE USE OF MEAN SURVIVAL TIME ANALYSIS TO DETERMINE COMPARATIVE TOXICITY OF FIRE ATMOSPHERES. Nav Med Res Inst, Bethesda, MD; Unnumbered Report, 11 pages, Dec 1976
Availability: NTIS AD-A040 507/6GA

Personnel survival in a fire is often determined by the toxicity of the atmosphere generated by the fire. The composition of the atmosphere is determined by the materials that are being combusted and the conditions under which they are burned. A method utilizing mean survival time measurements of rodents has been developed that provides a relatively rapid and inexpensive way of comparing the toxicity of fire atmospheres so that designers can have the necessary information to substitute less hazardous materials whenever possible. (This report was also published in *J Combust Toxicol*, 4(1):87-96, 1977. See *FTA*, 1(6), Abstract 2300.) (Author)

556. Alarie Y and Barrow SC
TOXICITY OF PLASTIC COMBUSTION PRODUCTS: TOXICOLOGICAL METHODOLOGIES TO ASSESS THE RELATIVE HAZARDS OF THERMAL DECOMPOSITION PRODUCTS FROM POLYMERIC MATERIALS. Pittsburgh Univ, PA, Grad Sch of Public Health; NBS GCR-77-85, 313 pages, Feb 1977
Availability: NTIS PB-267 233/5GA

Sensory and pulmonary irritation effects of thermal degradation products from natural and synthetic materials were studied using mice. Mice were used to develop a sensory irritation stress index based on changes in respiratory rate. In addition, acute lethality was obtained. Dose-response curves were generated for decomposition products from Douglas Fir, PVC, flexible polyurethane, teflon, and fiberglas reinforced polyester. Similar data were obtained for CO, CO2, low O2, acrolein, HCl and Cl2. Preliminary studies on the pulmonary effects of combustion products using rabbits are also reported. (Author)

557. Stocum WE and Hamilton RG
RISK ANALYSIS OF EXPOSURE TO HIGH CONCENTRATIONS OF ZINC CHLORIDE SMOKE. Sandia Labs, Albuquerque, NM; SAND 76-0386, 15 pages, Dec 1976
Availability: NTIS

During World War II it was discovered that HC military smoke may produce serious injury and death. This is apparently due to developments in smoke generation technology that result in the production of very finely divided zinc chloride particles. Unlike earlier forms of HC smoke, these particles can reach the lower respiratory tract passages and the lungs and cause corrosive tissue damage. Most of the reported cases of zinc chloride smoke injury have occurred during military or firefighting training exercises. When similar exercises were proposed at Sandia Laboratories, it was felt that a detailed risk analysis was necessary. The purpose of this report is to estimate the risk of toxic effects under the exposure conditions that are expected to occur. (Author)

558. Caplan YH
RELATIONSHIP OF CYANIDE TO DEATHS CAUSED BY FIRE. State of Maryland, Medical Examiner's Office; APL/JHU FPP TR31, 7 pages, 3 tables, 4 refs, Jun 1977
Availability: APL/JHU

Although Wetherell noted the occurrence of cyanide in the blood of fire victims, it was not until more recently that concern about the production of cyanide in fires reached national proportion. The increasing use of polymeric materials in buildings and home furnishings have increased the fire hazard potential of cyanide. Fires containing these materials are said to grow faster and generate more smoke and toxic gases, such as hydrogen cyanide, than those involving traditional materials. In response to the concern about the incidence of and role played by cyanide as a factor in fire fatalities, an extensive study was undertaken by the Maryland State Office of the Chief Medical Examiner and the Applied Physics Laboratory of the Johns Hopkins University. This report summarizes the findings of this study, the principal one being that the risk of cyanide toxicity varies with location within the fire, concentrations increasing with distance from the fire source.

559. Hilado CJ, Kolb EJ and Furst A
FIRE SAFETY IN THE HOME: RELATIVE TOXICITY OF THE PYROLYSIS PRODUCTS FROM SOME UPHOLSTERY FABRICS. State of Calif, Dept Consumer Affairs, Bur Home Furnishings, Sacramento, CA; SP-77-3, 40 pages, 2 figs, 4 tables, 3 refs, Jun 1977

Residential fires are a major fire problem in the United States. They have been more numerous and caused more dollar loss than fires in any other occupancy class and have caused about 55% of the fire deaths in the United States. In an earlier report, information on the relative toxicity of the pyrolysis products from a variety of materials used in home furnishings was presented. The materials described in that report included 21 samples of upholstery fabrics. This report presents relative toxicity test results on 88 samples of upholstery fabrics that were previously studied for smoldering characteristics. (Author)

560. Anon
FIRE SERVICE FIRST AID PRACTICES
Fire Protection Publications, Oklahoma State Univ, Stillwater, OK; 5th edit, 300+ pages, 1977

The 16 chapters of this new edition by the International Fire Service Training Association (IFSTA 109) include brief explanations of the circulatory, respiratory, nervous, skeletal, muscular, digestive, and genitourinary services, as well as injuries and treatment relating to each system; bleeding control and bandaging; artificial respiration; external cardiac compression and cardiopulmonary resuscitation; shock, poisoning, and emergencies due to heat and cold; fractures, sprains and dislocations; emergency childbirth; short distance transfer of patients and ambulances; conducting a primary and secondary survey; and other related subjects. A glossary of terms, index, firefighter death and injury survey, a pronunciation guide, and a magazine reference guide are provided.

c. EMERGENCY MEDICAL SERVICES AND FACILITIES

561. Morris GP [*Phoenix Fire Dept, AZ*]
EMS IS NOT A FIRE DEPARTMENT STEPCHILD
Fire Command; 44(8):32-35, 1977

The experience of the Phoenix, Arizona, Fire Department in integrating emergency medical services as the best means for rapid delivery of service is reported. The way in which the three objectives of the department were achieved, namely, to increase the level of medical training for all members, to work for legislation to authorize paramedic service, and to train and equip paramedics as soon as possible, is described. 1 fig, 1 photo.

562. Anon
PLANNING YOUR EMS WORKLOAD
Fire Command; 44(8):20-22, 1977

Materials extracted from a compilation of data on the emergency medical responses accumulated during one full year by nine fire departments are reported in this article to provide guidelines for the workload to be expected by fire departments beginning an emergency medical service (EMS) program. The data are plotted in tables and charts showing EMS alarms as a percent of all alarms, alarms per 1000 residents, situations found at rescue calls (%), number of units dispatched for various rescue calls, average response times and average "on-scene" times, total personnel time required to handle an emergency medical rescue incident, and rescue company annual activity. 2 charts.

d. INJURIES AND FATALITIES

563. Zawacki BE, Jung RC, Joyce J and Rincon E [*Univ Southern Calif* (*Los Angeles*)]
SMOKE, BURNS, AND THE NATURAL HISTORY OF INHALATION BURN INJURY IN FIRE VICTIMS
Ann Surg; 185(1):100-110, 1977

Mortality and morbidity in fire victims is largely a function of injury due to heat and/or smoke. While degree and area of burn together constitute a reliable numerical measure of cutaneous injury due to heat, as yet no satisfactory measure of inhalation injury has been developed. In this study, with fluid resuscitation and pulmonary infection eliminated as variables, dose-response curves were constructed as a measure of inhalation injury by exposing burned and unburned animals to smoke of constant temperature and toxicity under conditions similar to the fire situation. In these animals, the natural history of inhalation injury: 1) proved to be a relatively simple function of smoke and burn dosage; 2) appeared to simulate and therefore aid interpretation of the inhalation injury syndromes seen in human fire victims; 3) indicated that within limits (COHgb) measured immediately after injury was directly proportional to, and might prove to be a clinically valuable measure of, absorbed dose of smoke. While fluid resuscitation and pulmonary contamination with bacterial pathogens may be eliminated experimentally, such is not the case with the vast majority of fire victims admitted to burn services with associated inhalation injury. Fluid resuscitation and inhalation of a *Pseudomonas aeruginosa* aerosol were therefore included serially in a study of animals with inhalation injury and burns large enough to require fluid resuscitation. In these animals it was demonstrated that: 1) pulmonary edema occurred in association with too little rather than too much fluid therapy; 2) after aerosol inoculation, fatal bacterial pneumonia was difficult to produce when inhalation injury was associated with no or only small burns, but common when associated with a burn large enough to require fluid resuscitation. 5 figs, 4 tables, 35 refs. (Author)

564. Matter K
PRESSURE-CHAMBER TREATMENT FOR CARBON DIOXIDE INTOXICATION
Brandhilfe; 24(3):66-67, 1977 (German)

Four percent of all firefighters involved in accidents suffer CO intoxication. Even a concentration of 0.15% CO in air can result in severe injury. A promising therapeutic method is, therefore, recovery in a pressurized oxygen chamber in a pure oxygen atmosphere of 2 bars excess pressure. Important for the success of the treatment is immediate assignment (per helicopter) to such a system. The university clinics in Heidelberg and Tuebingen (FRG) have one-man chambers, to which, however, a doctor does not have direct access to the patient in case of emergencies. The Institute for Hyperbaric Therapy in Forst b. Bruchsal has available a larger, accessible pressure chamber for 18 people with a fore-chamber for 6 people, where all the treatment facilities are available. (Fachdok 13/0719)

565. Washburn AE [*Nat Fire Prot Assoc, Boston, MA, Fire Analysis Dept*]
FIRE FIGHTER DEATH TOLL RISES
Fire Command; 44(7):19-22, 1977

Data based on reports of firefighter fatalities received by the Fire Analysis Department of the National Fire Protection Association are presented. The 107 firefighter fatalities reported in 1976 represent an increase of five fatalities over 1975. A chart compares the causes of death in these two years, showing heart-related problems as the leading cause of death. The various causes are discussed individually in sections devoted to heart attack, mechanical injuries (building collapse, motor vehicle accidents, and others), burns, asphyxiation, electrocution, and drowning. 3 photos, 1 chart.

566. Stein JM [*Albert Einstein College of Medicine, Dept Surgery, Bronx, NY*] and Stein ED
SAFE TRANSFER OF CIVILIAN BURN CASUALTIES
J Am Med Assoc; 238(6):489-492, 1977

The advisability of transporting severely burned civilian patients to a definitive burn-care facility during the first hours following injury is discussed and methods providing safe transport for 353 civilian burn patients are described. Feasibility of and methods for transporting patients over various distances are outlined and the problems of jet transportation presented. Adequate communication between referring and receiving physicians is imperative, as are adequate preparation before evacuation and maintenance of intravenous fluid resuscitation, intake and output records, and sterile technique during transport. 1 fig, 4 refs. (Author)

567. Meacher DE and Word EL [*Inst Text Technol, Charlottesville, VA*]
THE ROLE OF TEXTILES IN PERSONAL INJURY BURN CASES
Text Chem Color; 9(1):19-23, 1977

A detailed study of burn cases treated at the University of Virginia Medical Center Burn Unit over an 8-month period was prompted by apparent inconsistency between the basic flammability properties of most textiles and descriptions of burn injuries in reports. The garments were not involved with the burn injury in all cases; of 42 cases, 24 involved fabric ignition, 17 did not, and 1 was unknown. In some cases, the garments played a protective role; in other cases, second and third degree burns were inflicted in areas of the body where the garment did not ignite. In most cases where the garments ignited and severe burn injuries resulted, factors such as intoxication, medication, physical impairment and psychosis limited the ability of the victim to react. It appears that the behavior of the individuals and the circumstances surrounding the incidents had a greater role in determining the nature and extent of burn injuries than did the flammability characteristics of the fabric itself. 4 tables. (Author)

568. Unbach K-H
BURNING BEHAVIOR OF TEXTILES MADE OF PES/COTTON AND 100% COTTON
Zentralbl Arbeitsmed Arbeitsschutz; 27(2):32-37, 1977 (German)

The tests reported here show that in fire accidents in which no combustible solvents are involved pure cotton clothing allows the wearer less time to avoid major injury by applying suitable extinguishing measures than does a mixed PES/cotton fabric. In addition, burns caused by pure cotton fabrics cover larger areas of the skin for the same burning times and, because of the greater heat transfer, penetrate deeper and are therefore more serious than in the case of the mixed PES/cotton fabric, in which a 65% PES component is more favorable than a 35% proportion. This is particularly true of underclothing, which reduces the amount of energy transferred considerably and thus reduces the degree of skin injury. 9 figs, 1 table, 6 refs. (Fachdok 13/0535)

10. HUMAN BEHAVIOR, SOCIAL, AND MEDICAL PROBLEMS

d. Injuries and Fatalities—Continued

569. Burke JF [*Harvard Univ Med School, Boston, MA*]
BURNS AMONG THE ELDERLY
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 290-297
Sponsor: Information Council on Fabric Flammability

The elderly are a particularly high risk population in terms of burn mortality; the death rate is some 50% in patients over 60, over 70% in patients over 75 on the basis of data from the incidents treated at the Massachusetts General Hospital. The most common injury is the flame burn (74%), from which 68% of the elderly die; even a burn of only 10% of the body surface area can be fatal, but the average burn area of a group of patients was 54%, due to inability of the elderly to react quickly and effectively. Clothing ignition is prominent, nightwear predominating. Efforts should be concentrated on providing flame-resistant clothing, especially sleepwear, for the elderly. 1 fig, 6 tables.

570. Word EL [*Inst Text Technol, Chem Res and Services*]
ANALYSIS OF FABRIC RELATED BURN INJURIES FROM PRODUCT SAFETY COMMISSION IN-DEPTH STUDY REPORTS
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 266-283
Sponsor: Information Council on Fabric Flammability

By working with 302 cases of fabric-related burn injuries originating in the National Electronic Injury Surveillance System (NEISS) it has been found that it is possible to store and work with the information needed to help the textile and apparel industries decide where research and development dollars can best be spent in the prevention of burn injury. From this small data source there does appear to be hope for some reduction of numbers of incidents and extent of injury associated with "simple" clothing fabric ignitions. The data from these 302 cases suggest that these reductions may be modest with present-day technology, but before any decisions can be made, a larger data base consisting of additional case reports must be analyzed. 11 tables.

571. Dixon AM and Fisher RS
FIRE FATALITY STUDY: HEART STUDY. State of Maryland, Med Examiner's Office; APL/JHU FPP TR33, 15 pages, 4 figs, 2 tables, Jul 1977
Availability: APL/JHU

This study was initiated to explore the inter-relationship between pre-existing heart disease and blood carbon monoxide levels inasfar as lethality is concerned. Persons with pre-existing heart disease would be expected to succumb to lower levels of carbon monoxide, that is, survive for a shorter period of time in a carbon monoxide contaminated atmosphere, than healthy individuals. This premise is based on the assumption that in an individual with heart disease, the myocardial oxygen supply is already in jeopardy when in a normal atmosphere. If the amount of oxygen in the blood is significantly reduced, as when preferentially replaced by carbon monoxide, then myocardial oxygen supply cannot keep up with demands and the heart will fail or develop fatal arrythmia. (Author)

e. PHYSIOLOGY

572. Musk AW, Peters JM and Wegmen DH [*Harvard Univ, School of Public Health, Occupat Health Prog, Boston, MA*]
LUNG FUNCTION IN FIRE FIGHTERS, 1: A THREE-YEAR FOLLOW-UP OF ACTIVE SUBJECTS
Am J Public Health; 67(7):626-629, 1977

From a cohort of 1768 Boston firefighters studied initially in 1970, pulmonary function measurements were repeated on 1146 active subjects in 1974. The mean time between examinations was 3.4 years. The data on 1430 subjects after one year of follow-up had indicated excessive decrements in levels of forced vital capacity and one-second forced expiratory volume which were related to the frequency of fire exposure. The annual decline over three years was less than that observed over one year and could not be related to the number of fires fought or to other indexes of acute fire exposure. Selection factors within the fire department appear to be important in protecting firefighters from continued loss of ventilatory capacity. 7 tables, 14 refs. (Author)

573. Reischl U [*Univ Calif (Irvine), Social Ecology Program*] and Reischl P
A HEAT STRESS MONITORING SYSTEM FOR FIRE FIGHTERS
Fire Technol; 13(2):121-125, 1977

A prototype environmental monitoring system capable of measuring thermal stress and physiological responses involves the use of a backpack transmitter with environmental and physiological transducers and a portable receiver with a direct dial readout. Strip chart recorders may be interfaced with the receiver whenever desired. Accurate information about heat stress exposures for firefighters is needed in the development of effective strategies for manpower allocation at the fire scene. 5 figs. (NFPA)

574. Nojiri T, Ukai T, Watanabe K, Endo N, Osaki H, Tanabe T and Yao K
PHYSIOLOGICAL CHANGES OF FIREMEN WITH BREATHING APPARATUS
Fire Sci Lab Japan. Rep; (13):100-105, 1976 (Japanese)

The methods and results of complex studies (under both laboratory and real conditions) aimed at evaluating various aspects of the effect on firefighters of rising oxygen breathing apparatus during a fire are described. The investigations were medico-physiological and were designed to allow simulation of a broad range of conditions and external parameters representing the main factors of the effects. In particular, the following parameters and conditions were varied: the air temperature and humidity; the meteorological conditions (wind speed and direction, intensity and nature of the precipitates); the weight of the firefighter's equipment; the intensity and nature of the stresses affecting the firefighter during the study; the characteristics of the breathing mixture; and the level of air saturation by smoke and toxic gaseous combustion products (in the studies the fire conditions were simulated by various smoke pots). In addition, tests were made of subjects with differing anthropometric data. The test results, presented in tabular and graphic form, give the dependence of such factors as muscular fatigue, blood pressure, physical and chemical composition of the blood and of the exhaled air, etc, on the parameters mentioned above (and on the time the human organism was exposed to these parameters). Particular attention is devoted to evaluating the magnitude and nature of negative residual phenomena in the firefighter after various stresses arising while using the oxygen apparatus. 9 figs, 5 tables, 5 refs. (RZh)

f. PSYCHOLOGY

575. McDaniel M, Herz L and Edelman P [*Loyola Univ, Fire and Human Behavior Res Center, Chicago, IL*]
BIBLIOGRAPHY OF HUMAN BEHAVIOR AND FIRES
Loyola Univ, Chicago, IL; 8 pages, Dec 1976

This bibliography of 100 entries covers the literature on human behavior and fires over the period 1956-1976, with most entries clustering in the period 1972-1976.

576. Weber V
REPEATED FIRESETTING OUT OF SEXUAL PERVERSION
Kriminalistik; 31(1):27-29, 1977 (German)

The perpetrator of a series of firesetting cases was found to be a night watchman who, as the investigations revealed and he himself stated, became strongly excited sexually when seeing fire. It was possible to correct the abnormal sexual drive by so-called stereotactic hypothalamotomy, surgical elimination of the drive center in the *medulla oblongata*, so that his normal behavioral patterns could be restored. (Fachdok 13/0489)

11. CODES, STANDARDS, SAFE HANDLING, IDENTIFICATION OF HAZARDS

a. CODES

577. Anon
LIFE SAFETY CODE 1976
NFPA, Boston, MA; 1976 edit, 1976

This recently revised code for safety to life in buildings and structures contains many changes and revisions, including new interior finish requirements on smoke generation, clarification of requirements for health care institutions, new requirements for smoke detectors in one- and two-family dwellings, and general updating of life safety requirements for industrial occupancies. All 17 chapters have been reorganized for uniform arrangement of requirements. A complete cross reference to code paragraphs of the 1973 edition is provided.

578. Grunau EB
FIRE PROTECTION PROBLEMS
Baugewerbe; 57(7):46, 48, 53-54, 1977 (German)

The author deals with the phenomenon of the increasing number and severity of fire incidents and raises the question as to whether the presently valid "Guidelines for the Use of Combustible Building Materials in Highrise Construction," especially the State Building Codes, are adequate for effective fire protection. The guidelines are criticized for their lack of definition, and the discretion permitted with regard to fire safety in the State Building Codes is stated as being too broad. These guidelines are compared with the new "Guidelines for Structural Fire Protection," which were derived from the "Guidelines for the Use of Combustible Building Materials" in revised form. Some ideas regarding reformulation of various points are put forth. 7 figs. (Fachdok 13/0741)

579. Bamert E
THE USE OF COMBUSTIBLE STRUCTURAL MATERIALS IN BUILDINGS
Chem Rundsch; 30(4):1-2, 1977 (German)

This article is a paper presented on the occasion of the meeting on "The New Fire Protection Guidelines" held by the Study Group of the Swiss Plastics Industry on 7 Dec, 1976, in Zurich. The guidelines and principles for the "Use of Combustible Structural Materials in Buildings," one component of the guidelines for fire and police regulations of the Cantonal Fire Association, have been revised. The regulations devised in the area of interior design and facings are outlined in the paper, revealing a considerable scope of application for wood and plastics. (Fachdok 13/0561)

580. Hostetler RE [*Pinellas County, FL, Board of County Commissioners*]
FLAMMABILITY OF BUILDING COMPONENTS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 39-50
Sponsor: Fire Retardant Chemicals Assoc

The confusion and descrepancies existing in code requirements for the flammability of building components are pointed out and discussed. It is recommended that the complexity of the codes be simplified by deleting a great deal of the legal phraseology and by compiling all specific requirements concerning one phase of restrictions in only one place in the code. Also recommended are that testing requirements for materials with regard to flame spread and other tests required by the code be standardized and that the furnishings as well as the building be controlled in fire protection.

581. Manning BR [*Southern Build Code Congr Internat*]
CONTEMPORARY CODE ISSUES REVOLVING AROUND FLAMMABILITY OF BUILDING COMPONENTS
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 51-60
Sponsor: Fire Retardant Chemicals Assoc

Some of the more economical thermal insulation, sound absorption, and trim materials are combustible and have high flame spread and density ratings. With the increased emphasis on energy conservation and noise pollution, this presentation discusses the Southern Building Code Congress International's immediate solution to both the economical need and fire-protection requirements by establishing related use criteria for these materials in buildings. In addition, the effect of increased insulation requirements of fire rated systems (particularly roof-ceiling systems) are discussed. (Author)

11. CODES, STANDARDS, SAFE HANDLING, IDENTIFICATION OF HAZARDS

a. Codes—Continued

582. Trellis A [*Nat Assoc Homebuilders, Tech Services*]
FLAMMABILITY IN BUILDING CONSTRUCTION
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 61-66
Sponsor: Fire Retardant Chemicals Assoc

The scope of the problem can be measured in lives lost and dollars spent as a result of fires. Our concern here is residential losses. What are the causes? How many are avoidable? The government response through foundation of NFPCA and federal standards on flammability shows increased concern. The building codes and NFPA are responding to new materials such as foam plastics. These responses add cost to new homes. Some instances of overregulation and ignoring the real causes are apparent. Analysis of the problem can lead to better solution and the Fire Retardant Chemical Industry can play a major role in better solutions. (Author)

b. HAZARDS IDENTIFICATION

583. Kjaersgaard E
TRANSPORTATION OF HAZARDOUS SUBSTANCES AND MATERIALS
Brandvaern; 2(11):8-10, 1976 (Danish; English Summary)

A detailed description is given of the labeling of 236 hazardous chemical substances and materials in accordance with the European convention on the international transportation of hazardous goods, which was ratified on October 1, 1975. 1 table.

584. Sadler KP [*Chem Industries Assoc, UK*]
CHEMSAFE AND OTHER PRECAUTIONS FOR THE SAFETY OF GOODS ON THE ROADS
Fire Prev; (119):22-23, 1977

A description is given of the chemical industry's (UK) own scheme for providing information on hazardous chemicals to emergency services, eg, the Chemical Industries Association publications such as *Road Transport of Hazardous Chemicals* and *Carriage of Hazardous Goods in Freight Containers*, together with details of other relevant schemes, such as the UK hazard information system (Hazchem coding) and Chemsafe. Sample labels and a typical transport emergency card are illustrated. 3 figs.

c. SAFE HANDLING OF HAZARDOUS MATERIALS

585. Davison E [*North Sea Ferries Ltd, Hull, UK*]
LOADS BY ROAD AND SEA
Fire; 70(864):26-27, 1977

Some of the problems encountered by the roll-on, roll-off ferry operator in transporting hazardous materials between the UK and the European mainland are outlined.

586. Katz WB [*Illinois Chem Corp, Highland Park, IL*]
HANDLING FLAMMABLE PRODUCT SPILLS WITHOUT DOING ENVIRONMENTAL DAMAGE
Fire Eng; 130(8):36-40, 1977

In order to assist fire departments to minimize environmental damage when handling flammable product spills, an oil spill expert presents some procedures for reconciling firefighting needs with environmental requirements. Storm sewer and local stream drainage directions can be determined from aerial photographs and topographic survey maps to determine streams receiving eventual spill flush flows. Equipment and expertise available in the area should be surveyed and the listings kept up to date. Regular training procedures should be established. The use of on-the-scene containment equipment and chemicals, such as booms, skimmers, sorbents, absorbing plastic beads, and dispersants, is described. 7 figs, 4 refs.

587. Clayton A [*BP Chemicals Ltd, Grangemouth, UK*]
TOWARDS SAFER TRANSPORTATION
Fire Eng J; 37(105):7-9, 1977

The object of this paper is to consider possible solutions that will provide safer transport and, at the same time, accommodate as far as possible other requirements, such as political, economic and environmental considerations. It is concluded that this objective can be best achieved by, wherever possible, separating the hazardous loads from human beings by better use of pipelines, rail and coastal traffic to feed distribution centers which, in turn, would distribute locally by road along specific routes. 4 figs.

588. Basson JK
HANDLING RADIOACTIVE MATERIALS SAFELY
Fire Eng J; 37(106):37-41, 1977

This article, which represents a paper delivered at a conference on fire protection in the petrochemical and allied industries held in Johannesburg, South Africa, reviews the status of the technological applications of radioactive isotopes and radiation, which has grown steadily in South Africa since 1948. The article begins with a review on nuclear physics, covering the atomic structure, nuclear force, radioactivity, particle accelerators, ionizing radiation and detection. This section is followed by a discussion of applied nuclear techniques, including petrochemical applications, smoke detectors, and the particular applications in South Africa. Health protection from radiation effects, radiation protection and control, and control by the Atomic Energy Board, are outlined. The article terminates with a description of the fire hazards, regulatory requirements, uranium fire hazards, and firefighting in radioactive areas, as an aid for planning and integration of measures in the fire service. 6 figs, 12 refs.

589. Powell BD
THE MARKING OF HAZARDOUS LOADS FOR THE TRANSPORT INDUSTRY IS NOT ENOUGH
J Br Fire Serv Assoc and Ind Fire Prot Assoc; 4(2):53, 1976

An analysis of the transportation of hazardous chemical loads shows that many of the difficulties connected with the suppression of the results of accidents could be simplified appreciably if appropriate information on the nature of the hazardous load were immediately available. In this case the transport vehicles can be equipped in advance with the required fire-extinguishing means and can be manned by trained personnel. It is important to increase the fire safety of transportation vehicles and to equip cabins and motor compartments with foam or powder fire extinguishers. The wheels and undercarriage must also be protected against fire. Brief information on hazardous goods accidents on the No. 66 highway in Northern Cumbria is given in which a chemical mixture spill occurred as a result of a tire fire, leading to a complicated situation. As a result, traffic was halted, the danger of an explosion was a possibility, as was the contamination of water sources, etc. It is pointed out that despite international conferences and symposia aimed at standardization of marking hazardous loads and describing these loads on tags, the existing practices are still incomplete and inadequate.

590. Stevens AM [*Justrite Mfg Co, Chicago, IL*]
DEFUSING A TIME BOMB...OR STORING FLAMMABLE LIQUIDS SAFELY
Nat Saf News; 115(4):66-67, 1977

The safe handling and storage of flammable liquids requires the use of approved equipment and practices to prevent fires and injuries. The author reviews some of the equipment and practices, in particular drum vents, solvent room safety, storage cabinets, and flammable liquid disposal, and cites the pertinent approved equipment and practices as established by Factory Mutual Research, Underwriters Laboratories Inc, and National Fire Protection Association, state and local codes, and OSH Act regulations. 4 photos.

591. Stevens AM [*Justrite Mfg Co, Chicago, IL*]
FLAMMABLE LIQUIDS — HOW TO GET THEM WHERE YOU NEED THEM SAFELY
Nat Saf News; 115(6):70-72, 1977

A brief review is given of methods and equipment for safe transfer of solvents from storage to points of use. The equipment and methods reviewed include safety cans for use in general industrial supply and disposal, for gas-powered equipment and other containers with small fill openings, laboratory operations, and abusive conditions, and their maintenance and inspection. Also reviewed are portable solvent tanks for transferring large quantities of flammable liquids. 5 photos.

592. Chesnay C
STORAGE AND TRANSPORTATION OF HIGHLY FLAMMABLE LIQUIDS AND SOLVENTS
Rev Secur; 11(119):49-56, 1976 (French)

Highly flammable liquids and combustible liquids are classified in three categories in accordance with their vapor flash temperature. Considered are highly flammable liquids characterized by a vapor flash temperature below 0°C at the normal vapor pressure of one bar and a temperature of 35°C. The principles of explosion safety of electrical apparatus are described. The transportation of highly flammable liquids by aircraft is regulated by international regulations. Only several kilograms are allowed in passenger aircraft and not more than 200 kg in cargo aircraft. In both cases the requirements for the strength and compactness of the container are rigorous. When these liquids are being transported by tanker ships, a major fire hazard is leakage of liquid into the sea and the formation of a layer of liquid on the surface of the water, where the use of any fire-extinguishing method is greatly inhibited. This hazard is greatly increased when these liquids are transported by river, since the current may drive the burning liquid not only toward other barges, but also to population centers. Depots and areas of operation with these liquids must be located away from population centers and residential areas. The greatest fire hazard arises when they are transported in tanker trucks and railroad cars, since spilling liquid may cause fires in water reservoirs and the accumulation of combustible gases in low places may lead to an explosion. In case of fire, the spillage of liquid must be contained and the transportation vehicles must be moved away from residential and protected zones. Figures are given for the vapor flash point, toxicity, radioactivity, corrosiveness, and other hazard parameters of these liquids. These figures are displayed in colored reflecting placards attached to the transportation vehicles carrying highly flammable liquids. Legislative documents on the classification of depots for highly flammable and combustible liquids and products in terms of their fire hazard during production are given. Instructions for the identification of containers with fire-hazardous materials are given, and the criminal or civil responsibility for accidents is pointed out. 3 tables. (RZh)

d. STANDARDS

593. Kongslav O
COMBUSTIBILITY. SCANDINAVIAN TEST METHODS
Brandvaern; 2(9):20, 23, 1976 (Danish; English Summary)

The scientific research facilities of Denmark, Norway, Sweden and Finland that conduct combustibility tests of materials have made adjustments to the test apparatus and methods recommended by the International Standardization Organization in ISO/DIS 1182, in which a "fire tube" type furnace 150 mm in length and 75 mm in diameter is used. The adjustments were made after tests of three identical materials were made in these facilities. The use of identical apparatus and the maintenance of the same temperature in the furnace and of identical temperature distribution profiles made it possible to obtain identical results. 1 fig. (RZh)

594. Anon
SAFETY STANDARDS IN PETROCHEMICAL PLANTS
Keiso; 19(9):44-50, 1976 (Japanese)

Information is given on a number of fire safety standards for petrochemical plants in Japan that have been revised or are in need of revision for various reasons. The safety factors for the majority of fire-hazardous technological processes have increased. In particular, in order to prevent the possibility of formation of an explosive mixture within apparatus and containers, the working temperature according to the new regulations must be set 12°C lower than the lower ignition temperature limit or must be increased by 12°C compared to the upper limit (formerly this parameter was 10°C in both cases). According to the new standards any apparatus generating particulates is considered to be explosion hazardous if the actual concentration exceeds a safety factor of 56% of the lower explosion limit of a given type of particulate (formerly 48-50%). A number of regulatory measures to reduce the quantity of suspended particles or the concentration of oxygen in the mixture have been developed for the most widely used technological systems with a dust explosion hazard. It is also reported that it is necessary to make a number of outdated safety standards more rigorous, especially those connected with the operation of pneumatic transport systems used for internal purposes in petrochemical plants. 3 figs. (RZh)

595. Phillips PE [*PE Phillips and Associates, Las Vegas, NV*]
DESIGNING A DEPENDABLE DETECTION SYSTEM
Specifying Engr; 37(6):94-99, 1977

The provisions of the new standard for automatic fire detectors, NFPA 72E, adopted by the National Fire Protection Association in May, 1974, are reviewed. The new standard provides basic minimum requirements for automatic fire detector performance to ensure timely warning for life safety and property protection. The standard considers heat, smoke and flame detectors and a miscellaneous category of other fire detectors. The requirements, advantages and disadvantages of the various detectors in the light of the new standard are discussed, and an effort is made to match the detection method with the protection to form a total effective system. 6 figs, 1 table.

596. Koukal M [*Wood Res and Dev Inst, Prague, Czechoslovakia*]
THE FLAMMABILITY AND FIRE RESISTANCE OF WOODEN BUILDING STRUCTURES
Zesz Probl Postepow Nauk Roln; (178):169-172, 1976 (Polish; English and Russian Summaries)

Drafts of some new fire protection standards for wooden building construction in Czechoslovakia are presented. The basic standard, CSN 73 0802, "Fire Safety of Building Objects," and the standard, CSN 73 0833 "Fire Safety of Apartment Buildings" are discussed. The basis of the flammability test according to CSN 73 0853 is the 10-minute effect of flame in the Landman burner on a test sample and mass loss in percent. Fire resistance, that is, the period of time over which a structure is resistant to high-temperature effects, is given in minutes. (Author)

597. Krasny JF, Braun E, Peacock R [*Nat Bur Standards, Inst Appl Technol, Prog for Fire Prev, Washington, DC*]
SYNTHESIS OF A GENERAL APPAREL FLAMMABILITY STANDARD
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 171-184
Sponsor: Information Council on Fabric Flammability

The National Bureau of Standards has recently submitted a draft of a general apparel flammability standard to the Consumer Product Safety Commission. If accepted by the Commission, proposed in the Federal Register, and issued in final form, this standard would replace CS 191-53, the present general wearing apparel standard. It is based on the Mushroom Apparel Flammability Tester (MAFT) concept. The paper describes in some detail the work on which this apparatus and the standard are based: analysis of burn accidents collected in FFACTS, work under grant at the University of Maryland and MIT, and experimental work at NBS and in other laboratories. 4 figs, 1 table, 16 refs. (Author)

12. INSURANCE, ECONOMICS OF LOSS AND PREVENTION

a. INSURANCE

598. Redfern JR [*Robins, Davies and Little Ltd, London, UK*]
PROBLEMS OF FIRE LOSS ADJUSTERS
Fire Eng J; 37(105):25-27, 1977

The tasks of the fire loss adjuster in the UK are described. One of them is to make an investigation into the cause in conjunction with the police and fire brigade authorities. The damage to the structure, to the contents, and the adverse effect on future trading must be evaluated. The damage control portion of the adjuster's task relates to arrangements for immediate demolition of dangerous structures, protection of the remainder of the premises, and discussion of how business can continue. These tasks are illustrated on the basis of a fire at a leisure and entertainment center. The consequential (business interruption) loss insurance practice in the UK is outlined. (This paper was presented in the session on damage control at the Institution of Fire Engineers 1976 Conference.)

599. Wenstrom LO
FIRE INSURANCE AND PLASTICS
Plastforum; 7(11):56-57, 59, 61, 1976 (Swedish)

A detailed calculation is made of the price charged for insurance premiums in Sweden for plants as a function of the fire-hazard class of the buildings and products. As a rule, the use of plastic structural components or of plastics in the production cycles results in higher premiums, sometimes much higher. 3 tables. (RZh)

600. Strulovici C
VARIOUS TRENDS IN FIRE INSURANCE OF INDUSTRIAL ESTABLISHMENTS
Rev Tech Feu; 17(161):54, 56, 58-64, 1976 (French)

The contents of a report presented at a special conference by a representative of the board of the Plenary Assembly of Insurance Companies for the case of fires are given. Information is presented on the foundation, structure and functions of the insurance association. Statistical data demonstrating the continuous increase in the fire hazard of industrial enterprises and on the increase in the number of major fires and the fire losses are cited. The scheme used to calculate insurance premiums for enterprises is described. A detailed explanation is given of how to calculate the degree of fire safety of a plant for the purpose of setting the value of insurance premiums. Recommendations are made as to implementing fire safety in industrial establishments. 6 figs. (RZh)

601. Lingenfelter GE [*Am Ins Assoc, Engineering and Safety Service*]
CONTEMPORARY ISSUES EVOLVING AROUND FLAMMABILITY OF BUILDING COMPONENTS — THEIR IMPORTANCE TO THE INSURANCE INDUSTRY
Fire Retardant Chemicals Assoc Meeting, Fall, 1976, Papers; 1976, Oct 18-21, Orlando, FL, pages 81-89
Sponsor: Fire Retardant Chemicals Assoc

An attempt is made to present some of the issues regarding building component flammability of importance to the insurance industry, such as "non-combustibility" of materials (does it burn, and if it does, what amount of burning is "acceptable" or "safe"), the flammability of floor coverings, the toxicity of combustion products, smoke and its effect on visibility during building fires, flammability of furnishings, and plastics in building construction. The insurance industry must be concerned not only with property loss prevention, but also life safety issues of flammability, because of the variety of types of insurance made available (product liability, public or professional liability, workers' compensation, and health and life insurance).

602. Yuill CH
FIRE LOSSES: A NEEDLESS WASTE
Constr Specifier; 30(6):36, 38-44, 1977

Examined in this article is the available information concerning fire losses, the more significant causative factors, and the meaning of current knowledge in terms of more effective fire prevention efforts. The article was presented at a symposium "Trends in Fire Protection" held in April, 1976, by the Society of Wood Science and Technology, the aim of which was to review the status and future of fire protection engineering in regards to wood use in construction. 10 figs.

603. Smith KG [*London Salvage Corps, UK*]
DAMAGE CONTROL REPLACES SALVAGE
Fire Eng J; 37(105):22-24, 1977

The various aspects of damage control are considered within the framework of conservation of the limited UK national resources. Prime importance is accorded to preplanned arrangements for dealing with the effects of fire and fire-fighting operations. Segregation of hazards and ventilation, as well as covering of sensitive equipment, are recommended. The composition, equipment, apparatus, and techniques of the two salvage corps units, damage control and special equipment, are outlined. Costs of the corps are compared to savings achieved. (This paper was presented at the Institution of Fire Engineers 1976 Conference.)

604. Anon
FIRE AND PROPERTY LOSS EXPERIENCE. US ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION. US Energy Res and Dev Admin, Div Operat and Environ Safety; Unnumbered Report, 27 pages, 2 figs, 4 tables, Jul 1977
Availability: NTIS

In the second year of its history, 1976, ERDA experienced $2.3 million in total property losses, a drop of $3 million from the 1975 experience. This results in an overall property loss ratio of $0.65 per hundred dollars of property replacement value. This figure is about 1/4 of the loss ratio experienced by a better class of insured industrial risks as a result of fire alone (ERDA fire losses are less than 14% of total losses). Despite the comparatively excellent cumulative performance of ERDA in its two-year history, both the fire-loss ratio and the total loss ratio are about double that achieved by the AEC in its last 5 years of operation. Since over 99% of the property values, and nearly all the reportable losses, occurred in facilities formerly part of the AEC, utilization of AEC data is valid for comparative purposes. Thus, while the overall record is still excellent by any nationwide comparison, it does indicate a probable relaxation of the outstanding success formerly achieved. As the extent and diversification of ERDA facilities continues to grow, increased efforts will be required to sustain the current excellent record and even stronger efforts will be necessary to restore the earlier level of performance. This document is intended to assist safety and operating staffs in the evaluation of their performance and illustrate areas where improvements can be obtained.

b. LOSSES

c. RESTORATION

d. RISK MANAGEMENT

605. Stevens RP [*M and M Protection Consultants*]
FIRE PROTECTION: PRACTICAL, OR PERFECT?
Fire J; 71(2):51-54, 1977

The difficulties of developing fire protection criteria that will be attractive in spite of inflation and cutbacks in fire protection, based on economic conditions, and that will not compromise the quality of protection are discussed. Examples are given of the advantages of discarding tradition and recommending the equipment that will do an adequate job at the most reasonable cost. The increasing use of performance-specified or hydraulically calculated sprinkler systems does much to reduce the cost of essential production. (This article is a reprint of an address presented by the author to the 80th NFPA Annual Meeting held on May 17-20, 1976, in Houston, Texas.) (NFPA)

606. Anon
CONSIDERATIONS IN THE APPLICATION OF AUTOMATIC FIRE DETECTION SYSTEMS
Fire Prot Rev; 40(438):22, 27-28, 1977

In this article the technical editor of *Fire Protection Review* summarizes some of the information available on automatic fire detection. The fact that cost is usually a factor that has to be seriously considered in planning an installation is underlined. Consequently, it is seldom feasible to provide all the automatic detection facilities to ensure maximum reliability. The prime criterion used in determining the fire safety level is what level is necessary to prevent the loss of life.

607. Anon
SPRINKLERS AND THEIR RELATIONSHIP TO FIRE-RESISTANCE REQUIREMENTS
Fire Prot Rev; 40(438):31, 1977

The subject under discussion at a recent fire technology forum organized by the Fire Protection Association and the Institution of Fire Engineers (UK) was sprinklers and their relationship to fire-resistance requirements. The various opinions expressed related to trade-offs between the sprinkler installations and structural fire resistance, sprinkler reliability and life safety, trade-offs between sprinklers and automatic fire detection and alarm systems, and cost-benefit analyses of fire protection equipment such as sprinklers on the basis of fire statistics.

608. Wilson R [*Firepro Inc, Wellesley, MA*]
THE L-CURVE: EVALUATING FIRE PROTECTION TRADEOFFS
Specifying Engr; 37(6):110-113, 1977

A means of measuring fire safety, called the fire safety design methodology, which was devised in 1973, provides a numerical evaluation and permits engineers to share judgement with each other and those with whom they work. Described in this article is one crucial part of the system, the L-curve, where L stands for limit of flame movement. The paper that the L-curve appears on is the final step in the flame management phase of the fire-safety design methodology. The vertical axis is the probability of flame termination, the horizontal axis is the area of flame. Flame termination can be in three ways, by self-termination, automatic or manual extinguishment. The fire protection features of the property can be plotted on the curve to permit judgements to be made regarding fire-safety tradeoffs. The details of the plotting and projecting methods are described. 7 figs.

609. Mayer F [*CIBA-Geigy AG, Basel, Switzerland*]
IS THE EXPENSE INVOLVED IN PREPARATION OF LESS FLAMMABLE TEXTILES JUSTIFIED? DISCUSSION BY MEANS OF BENEFIT-RISK ANALYSIS
Textilveredlung; 12(8):327-333, 1977 (German; English Summary)

Any discussion about the pros and cons of flame retardant textiles is complicated because both supporters and opponents proceed from different assumptions and arrive therefore at contradictory answers. This is because of the enormous number of aspects involved in textile flammability. As is often the case, the choice is not between right or wrong. Rather, the sensible approach will lie somewhere in between, ie, it will be almost right or it will probably be wrong. The benefit-risk analysis can be used to arrive at the correct decision. In this connection the textiles first have to be categorized according to their end-use. Important arguments in the benefit-risk comparison are psychological aspects, different expectations, degree of care, aversion, etc. Provided he appreciates these factors and complies with the needs of the various interested groups, the textile manufacturer will in the long run be able to provide an affirmative answer to this question. 5 figs, 7 tables, 17 refs. (Author)

610. Hyman D, Smith BF and Dardis R [*Univ Maryland (College Park), College of Human Ecol, Dept Textiles and Consumer Economics*]
COST-BENEFIT ANALYSIS OF FLAMMABILITY STANDARDS FOR CHILDREN'S SLEEPWEAR AND CLOTHING: SIZES 7-14
Information Council on Fabric Flammability Meeting, Annual, 10th, Proc; 1976, Dec 6-9, New York, NY, pages 297-306
Sponsor: Information Council on Fabric Flammability

Cost-benefit analysis may be viewed as making a significant contribution to consumer protection programs in two major areas. First, cost-benefit analysis serves as a decision-making tool which makes explicit the costs and benefits of a particular safety program. Second, it serves as a basis for program comparisons. Thus, the cost-benefit ratio for a particular safety program is less important than its relationship to cost-benefit ratios for alternative programs. The results of this study indicate that the 7-14 Children's Sleepwear Standard is cost-effective in contrast to the hypothetical 7-14 Children's Clothing Standard, where high cost-benefit ratios exist. In this instance, the employment of a specific rather than a generic standard appears to have been the most appropriate consumer protection program. 2 figs, 3 tables, 11 refs. (Author)

e. SALVAGE

13. STATISTICS

611. Delfos DCD
THE NECESSITY OF FIRE PROTECTION IN THE TEXTILE INDUSTRY
ASELF; (56):67, 69, 71, 1976 (Spanish)

In Spain insurers paid out 100,000,000 pesetas for 228 fires in the textile industry in 1975 for a loss of 80%. In 1974 the loss was 110%. The number of fires in the textile industry in Barcelona and adjacent regions averaged 100 per year in the period of 1974-1975, that is, one fire in every three days. An analogous situation has been observed in the textile industry in other European countries. In Great Britain, for example, every 19th industrial fire in 1972 was in the textile industry, each with a loss of more than 40,000 pounds. In 17% of these major fires the factory buildings were equipped with fixed sprinkler installations. This is explained by the fact that more than the design number of sprinklers were triggered during the fire, because in these cases the fire broke out in areas not protected by sprinklers and became fully developed before the sprinklers were actuated. The statistics indicate that in 60% of the major fire incidents the fires broke out at night and were therefore not discovered until the size of the fire had become great. Another reason for the ineffectiveness of the sprinkler system is the abrupt rise in temperature, which is typical for the textile industry; that is, the fire developed slowly over a large area and then the fire became suddenly intense, accompanied by an abrupt jump in temperature.

612. Anon
FPA CASEBOOK OF SOME RECENT MAJOR FIRES
Fire Prev; (119):31-44, 1977

The FPA casebook contains a statistical compilation of major fire damage in the UK for January-February, 1977, and a brief description of some notable non-UK fires for the same period. Eight major fires are discussed in terms of main features, including estimated damage, description of premises, cause of fire, and narrative of the fire. Other notable fires in powder mills and three summer heat fires are described in brief. Illustrations, diagrams, and photographs accompany the various incidents. 16 photos, 7 figs.

613. Anon
US AIR CARRIER ACCIDENTS INVOLVING FIRE, 1965 THROUGH 1974, AND FACTORS AFFECTING THE

13. STATISTICS

e. Salvage—Continued

STATISTICS. SPECIAL STUDY. Nat Transp Safety Board. Bureau of Technol ; NTSB-AAS-77-1 , 64p, Feb 77

Availability: NTIS PB-266 883/8GA

The study presents the statistical data on US air carrier accidents involving fire from 1965 through 1974. The statistics are compared with data contained in Bureau of Safety Pamphlet (BOSP) 7-6-3, which treats the same subject for the years 1944 through 1974. The study concludes that there have been significant improvements in occupant survivability. While fire still occurs in about 20% of the accidents in scheduled passenger operations, the ratio of fatalities from all causes to exposed occupants has declined 65% in this study period and the ratio of fatalities from the effects of fire and smoke to exposed occupants has declined 37%. The almost exclusive use, in this study period, of turbojet-powered aircraft, their improved reliability, and the use of kerosine-type fuel are factors influencing the statistics. The anticipated upgrading of the Federal Aviation Regulations and the expected effects of the recently implemented requirements of 14 CFR 139 are expected to improve even further occupant survivability of accidents involving fire.

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EXPANSIONS OF JOURNAL ABBREVIATIONS

Aircraft Eng	*Aircraft Engineering*
Allo 18	*Allo 18* [Calling 18]
Aluminium (Duesseldorf)	*Aluminium* [Aluminum]
Am J Publ Health	*American Journal of Public Health*
Ann Surg	*Annals of Surgery*
Antincend Protez Civ	*Antincendio e Protezione Civile* [Fire and Public Protection]
Arch Environ Health	*Archives of Environmental Health*
Arch Termodyn Spal	*Archiwum Termodynamiki i Spalania* [Archives of Thermodynamics and Combustion]
Aruminyumu	*Aruminyumu* [Aluminum]
ASELF	*Asociacion Espanola de Lucha Contra el Fuego* [Spanish Fire Fighting Association]
ASME Trans. Ser C. J Heat Transfer	*American* Society of Mechanical Engineers. Transactions. Series C. Journal of Heat Transfer
ASTM Standardization News	*American Society for* Testing and Materials. Standardization News
Aust Plast Rubber	*Australian Plastics and Rubber*
Baugewerbe	*Baugewerbe* [Building Trade]
Berufsgenoss	*Berufsgenossenschaft* [Employers' Liability Insurance]
Betonwerk – Fertigteil-Tech	*Betonwerk + Fertigteil-*Technik [Concrete Work + Finished Parts Technology]
Bezop Tr Prom-sti	*Bezopasnost Truda v Promyshlennosti* [Occupational Safety in Industry]
Bezpieczen Pr	*Bezpieczenstwo Pracy* [Occupational Safety]
Binnenschiffahrts-Nachr	*Binnenschiffahrts-Nachrichten* [Inland Shipping Communications]
Brandhilfe	*Brandhilfe* [Fire Assistance]
Brandschutz	*Brandschutz. Deutsche Feuerwehr-Zeitung* [Fire Protection. German Fire Service Gazette]
Brandvaern	*Brandvaern* [Fire Protection]
Brandwacht	*Brandwacht* [Firewatch]
Brass Malt Europe	*Brasserie et Malterie en Europe* [Brewing and Malting in Europe]
Br Plast Rubber	*British Plastics and Rubber*
Budow Okretowe	*Budownictwo Okretowe* [Naval Architecture]
Build Eng	*Building Engineering*
Build Syst Des	*Building Systems Design*
Cah Cent Sci Tech Batim	*Cahiers du Centre* Scientifique et Technique du Batiment [Communications of the Scientific and Technical Building Center]
Can Soc Forensic Sci J	*Canadian Society of* Forensic Science Journal
Can Text J	*Canadian Textile Journal*
Chantiers	*Chantiers* [Ship Yards]
Chem Eng/Deskbook Issue	*Chemical Engineering/Deskbook* Issue
Chemiefasern/Text Ind	*Chemiefasern/Textilindustrie* [Chemical Fibers/Textile Industry]
Chem Rundsch	*Chemische Rundschau* [Chemical Review]
Chem Tech (Heidelberg)	*Chemie-Technik (Heidelberg)* [Chemistry Technology (Heidelberg)]
Chest	*Chest*
Coal Age	*Coal Age*
Combust Flame	*Combustion and Flame*
Combust Sci Technol	*Combustion Science and* Technology
Computer Des	*Computer Design*
Constr Specifier	*Construction Specifier*
Consult Eng	*Consulting Engineer*
Data Manage	*Data Management*
Decis Sci	*Decision Sciences*
Denryoku to Tetsudo	*Denryoku to Tetsudo* [Electric Lighting and Facilities in Railways]
Densetsu Kogyo	*Densetsu Kogyo* [Electrical Construction Engineering]
Diesel Gas Turb Progr	*Diesel and Gas Turbine* Progress
Diteru	*Diteru* [Detail: Magazine for Architects and Engineers]
Drahtwelt	*Drahtwelt* [Wire World]
Dun's Rev	*Dun's Review*
Electr Constr Maint	*Electrical Construction and* Maintenance
Elek-Prakt	*Elektro-Praktiker* [Electrical Practitioner]
Energetik	*Energetik* [Power Engineer]
Energetyka (Poland)	*Energetyka (Poland)* [Power Engineering (Poland)]
Engineering (London)	*Engineering (London)*
Eng Mat Des	*Engineering Materials and Design*
Environ Health Perspect	*Environmental Health* Perspectives
Face au Risque	*Face au Risque* [Facing the Risk.

	Journal of the French National Prevention and Protection Center]
Fahrzeug Kaross	*Fahrzeug und Karosserie* [Vehicle and Car Bodies]
Faserforsch Textiltech	*Faserforschung und Textiltechnik* Zeitschrift fuer Polymerforschung [Fiber Research and Textile Engineering. Journal of Polymer Research]
Feuerwehr	*Die Feuerwehr* [The Fire Service]
Fire	*Fire*
Fire Chief	*Fire Chief*
Fire Command	*Fire Command*
Fire Eng	*Fire Engineering*
Fire Eng J	*Fire Engineers Journal*
Fire Fighting Canada	*Fire Fighting in Canada*
Fire Internat	*Fire International*
Fire J	*Fire Journal*
Fire Prev	*Fire Prevention*
Fire Prev Sci Technol	*Fire Prevention Science and* Technology
Fire Prot Rev	*Fire Protection Review*
Fire Res Inst Japan. Rep	*Fire Research Institute of* Japan. Report [Shobo Kenkyusho Hokoku]
Fire Sci Lab Japan. Rep	*Fire Science Laboratory of* Japan. Report [Shobo Kagaku Kenkyushoho]
Fire Service Inf	*Fire Service Information*
Fire Technol	*Fire Technology*
Flight Internat	*Flight International*
Flight Oper	*Flight Operations*
Gaz Arch	*Gazette des Archives* [Archives Gazette]
Glueckauf	*Glueckauf* [Journal of Mining Engineering and Industry]
Haikan Gijutsu	*Haikan Gijutsu* [Piping Engineering]
Haikan to Sochi	*Haikan to Sochi* [Piping and Process Machinery]
Hansa	*Hansa; Zeitschrift fuer Schiffahrt, Schiffbau,* Hafen [Hansa; Journal of Shipping, Shipbuilding, Ports]
Hitachi Hyoron	*Hitachi Hyoron* [Hitachi Review]
Household Pers Prod Ind	*Household and Personal* Products Industry
ICAO Bull	*International Civil Aviation Organization* Bulletin
Ind Elektr – Elektron	*Industrie Elektrik +* Elektronik [Electrical and Electronics Industry]
Ind Ital Cem	*Industria Italiana del Cemento* [Italian Cement Industry]
Inf Constr	*Informes de la Construccion* [Construction News]
Insulation (London)	*Insulation (London)*
Internat Zivilverteidigung	*Internationale* Zivilverteidigung [International Civil Defense]
J Am Med Assoc	*Journal of the American Medical* Association
J Appl Polym Sci	*Journal of Applied Polymer* Science
J Br Fire Serv Assoc and Ind Fire Prot Assoc	Journal of the British Fire Service Association and of the Industrial Fire Protection Association
J Coated Fabrics	*Journal of Coated Fabrics*
J CombustToxicol	*Journal of Combustion Toxicology*
J Consumer Prod Flammability	*Journal of Consumer* Product Flammability
J Fire Flammability	*Journal of Fire and Flammability*
J Fire Retard Chem	*Journal of Fire Retardant Chemistry*
J Occup Med	*Journal of Occupational Medicine*
J Sound Vib	*Journal of Sound and Vibration*
Kasai	*Kasai (Nihon Kasai Gakkai-shi)* [Journal of the Fire Prevention Society of Japan]
Kayakurui, Koatsu Gasu Torishimari Geppo	*Kayakurui,* Koatsu Gasu Torishimari Geppo [Monthly Report of Explosives and High Pressure Gas]
Keiso	*Keiso* [Instrumentation]
Knitting Times	*Knitting Times*
Koroze Ochr Mater	*Koroze a Ochrana Materialu* [Corrosion and Protection of Materials]
Krafthand	*Krafthand* [Krafthand; Journal of Technology]
Kriminalistik	*Kriminalistik* [Criminology]
Kuki Tyowa to Reito	*Kuki Tyowa to Reito* [Air Conditioning and Refrigeration]
Ladenburger Kreis	*Ladenburger Kreis* [Ladenburg Ring; Company Journal of Total-Foerstner u. Co]
Lager	*Lager* [Warehouse]
Lakokras Mater Ikh Primen	*Lakokrasochnye Materialy* i Ikh Primenenie [Paints and Varnishes and Their Applications]
Landtech Inf	*Landtechnische Information* [Agricultural Engineering Information]
Laniera	*Laniera* [Wool Manufacturing]
Liteinoe Proizvod	*Liteinoe Proizvodstvo* [Foundry Practice]
Lung	*Lung*
Luz y Fuerza	*Luz y Fuerza* [Light and Energy]
Maschinenmarkt	*Maschinenmarkt* [Machinery Market]
Mater Maquin y Metodos Constr	*Materiales, Maquinaria y* Metodos para la Construccion [Construction Materials, Machinery and Methods]
Medd fran Statens Brandnamnd	*Meddelanden fran Statens* Brandnamnd [Communications from the State Fire Administration]
Med Sci Law	*Medicine, Science, and the Law*
Melliand Textilber	*Melliand Textilberichte* [Melliand Textile Journal]
Metallverarbeitung	*Metallverarbeitung* [Metal Finishing]
Mod Paint Coatings	*Modern Paint and Coatings*
Nafta (Poland)	*Nafta (Poland)* [Petroleum (Poland)]
Nat Saf News	*National Safety News*

EXPANSIONS OF JOURNAL ABBREVIATIONS

Nihon Kasai Gakkai Ronbunshu .... *Nihon Kasai Gakkai Ronbunshu* [Bulletin of the Japanese Association of Fire Science and Engineering]

Nihon Kikai Gakkaishi .... *Nihon Kikai Gakkaishi* [Journal of the Japanese Society of Mechanical Engineers]

Norsk Plast .... *Norsk Plast* [Norwegian Plastics]

Norsk VVS ..... *Norsk Forening for Varme-, Ventilasjon- og* Sanitaerteknikk [Norwegian Society for Heating, Ventilation and Sanitary Engineering]

Nucl Eng Des .... *Nuclear Engineering and Design*

Oesterr Feuerwehr .... *Oesterreichische Feuerwehr* [Austrian Fire Service]

Ohm: Denki Zasshi .... *Ohm: Denki Zasshi* [Ohm Journal]

Omron Tech .... *Omron Technics* [Omuron Tekunikusu]

Oper Res .... *Operations Research*

Pet Rev .... *Petroleum Review*

Plant Eng .... *Plant Engineering*

Plastforum .... *Plastforum* [Plastics Forum]

Plasticonst .... *Plasticonstruction/Bauen mit* Kunststoffen/Plastics in Building/Plastiques et Construction

Plumb Eng .... *Plumbing Engineer*

Pozhar Delo .... *Pozharnoye Delo* [Firefighting]

Pr Cent Inst Ochr Pr .... *Prace Centralnego Instytutu* Ochrany Pracy [Papers of the Central Occupational Safety Institute]

Prom Energ .... *Promyshlennaya Energetika* [Industrial Power]

Prot Civ Secur Ind .... *Protection Civile et Securite* Industrielle [Civil Protection and Industrial Security]

Przegl Poz .... *Przeglad Pozarny* [Fire Review]

Przem Drzew .... *Przemysl Drzewny* [Wood Industry]

Record .... *Record*

Reito Kucho Gijutsu .... *Reito Kucho Gijutso* [Techniques of Refrigeration and Air Conditioning]

Rev Secur .... *Revue de la Securite* [Safety Review]

Rev Tech Feu .... *Revue Technique du Feu* [Fire Engineering Review]

Riv Combust .... *La Rivista dei Combustibili* [Fuel Review]

Saf Sea Internat .... *Safety at Sea International*

Sb Tr VNII Protivopozhar Oborony .... *Sbornik Trudov* Vsesoyuznogo Nauchno-Issledovatel'skogo Instituta Protivopozharnoy Oborony [Digest of Papers of the All-Union Fire Protection Research Institute]

Schienenfahrzeuge .... *Schienenfahrzeuge* [Railway Vehicles]

Schiff Hafen .... *Schiff und Hafen* [Ships and Ports]

Schott Inf .... *Schott-Information* [Schott Information. Journal of the Jena Glass Co]

Schweisstechnik (Berlin) .... *Schweisstechnik* (Berlin) [Welding Technology (Berlin)]

Schweiz Feuerwehr Z .... *Schweizerische Feuerwehr-*Zeitung [Swiss Fire Service Journal]

Science .... *Science*

Seewirtsch .... *Seewirtschaft* [Merchant Marine]

Sekiyu Shiryo Geppo .... *Sekiyu Shiryo Geppo* [Monthly Report on the Petroleum Industry]

Sekiyu to Sekiyu Kogaku .... *Sekiyu to Sekiyu Kogaku* [Petroleum and Petrochemicals]

Sharyo to Denki .... *Sharyo to Denki* [Railway Car and Electric Equipment]

Shisetsu .... *Shisetsu Nenpo* [Annual Report of Japan Railway Civil Engineering Association]

Sigurnost .... *Sigurnost* [Safety]

Skilling Min Rev .... *Skillings' Mining Review*

Soda to Enso .... *Soda to Enso* [Soda and Chlorine]

Specifying Engr .... *Specifying Engineer*

Steir Feuerwehrbl .... *Steirisches Feuerwehrblatt* [Styrian Fire Services Journal]

Stroit Mekh Raschet Soor .... *Stroitel'naya* Mekhanika i Raschet Sooruzheniy [Structural Mechanics and Calculation of Structures]

TAB Tech Bau .... *TAB Technischer Bau* [TAB Building Technology]

Tanker Bulker Internat .... *Tanker and Bulker* International

Tech Rundsch .... *Technische Rundschau* [Technical Review]

Tech Ueberwach .... *Technische Ueberwachung* [Technical Security Supervision]

Tetsudo Gijutsu Kenkyu Shiryo .... *Tetsudo Gijutsu* Kenkyu Shiryo [Journal of Railway Engineering Research]

Text Chem Color .... *Textile Chemist and Colorist*

Textilveredlung .... *Textilveredlung* [Textile Finishing]

Text Inst Ind .... *Textile Institute and Industry*

Text Month .... *Textile Monthly*

Text Res J .... *Textile Research Journal*

Ugol (USSR) .... *Ugol (USSR)* [Coal (USSR)]

Unser Brandschutz .... *Unser Brandschutz* [Our Fire Protection]

Vaeg- och Vattenbygg .... *Vaeg- och Vattenbyggaren* [Highway and Waterway Engineering]

Verkehrsrundsch .... *Verkehrsrundschau* [Traffic Review]

VFDB Z .... *Zeitschrift der Vereinigung zur Foerderung* des Deutschen Brandschutzes [Journal of the Association for the Advancement of Fire Protection in Germany]

Weld World .... *Welding in the World*

Yuatsu Gijutsu ..... *Yuatsu Gijutsu* [Hydraulics Engineering]

Zentralbl Arbeitsmed Arbeitsschutz .... *Zentralblatt* fuer Arbeitsmedizin und Arbeitsschutz [Journal of Industrial Medicine and Occupational Safety]

Zesz Nauk Politech Slask ...... *Zeszyty Naukowe Politechniki* Slaskiej [Scientific Reports of the Silesian Polytechnic]

Zesz Probl Postepow Nauk Roln .... *Zeszyty Problemowe* Postepow Nauk Rolniczych [Papers on Progress in Agricultural Science]

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